FROM WIND TO WINE

PETITION TO ESTABLISH THE

PETALUMA GAP

AMERICAN VITICULTURAL AREA

AND

MODIFY THE BOUNDARY OF THE EXISTING

NORTH COAST AVA

Submitted by:

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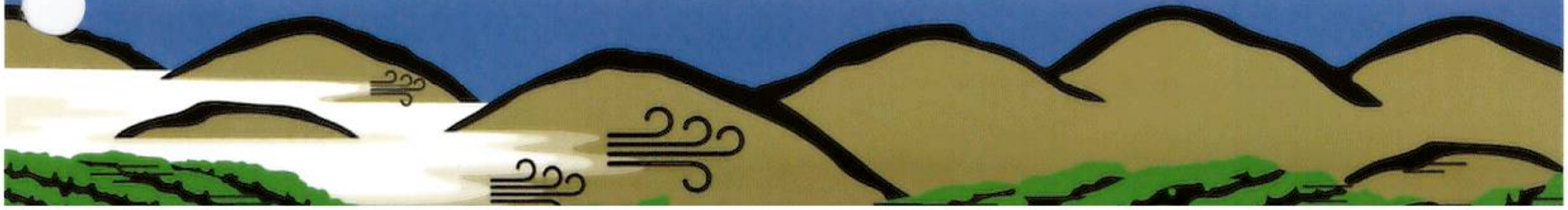
PETALUMA GAP
WINEGROWERS ALLIANCE



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FROM WIND TO WINE

SECTION 1.0
INTRODUCTION

The following petition serves as a formal request for the establishment and recognition of an American Viticultural Area (AVA) to be named Petaluma Gap, located in southern Sonoma County and northern Marin County, California. The proposed AVA covers approximately 202,476 acres and includes approximately 4,000 acres of planted and productive vineyards across approximately 80 vineyards. There are 9 bonded wineries in the area. This petition is being submitted by the Petaluma Gap Winegrowers Alliance (PGWA) as representative of vintners and growers in the area. PGWA member wineries and growers supporting this petition are listed in **Exhibit B,** PGWA Member Wineries and Growers.

The petition contains all the information required to establish an AVA in accordance with Title 27 Code of Federal Regulations (CFR) part 9.3.

The Petaluma Gap is a wine growing geographic region of southern Sonoma County and northern Marin County known for consistent wind patterns of Pacific air moving through the Petaluma wind gap. The region also should be recognized for its related topography of rolling hills, many of which are windswept. This cool-climate grape growing region is distinguished from other areas of the Sonoma Coast AVA and other surrounding cool-climate grape growing regions by both its topography and related climate.

Portions of the text of this petition have been reproduced with permission from a report prepared by Patrick L. Shabram and submitted as **Exhibit A** (referred to herein as the "Shabram report"). The Shabram report was prepared to identify the characteristics of the Petaluma Gap viticultural area that distinguishes it from surrounding areas. A number of copyrighted sources also are quoted and referenced in this petition. In the case of websites, complete URLs are provided. Copies of other materials may be provided upon request as needed by the TTB and as allowed under fair use guidelines for copyrighted material.

Overview

The Petaluma Gap has long been recognized as a viticultural region of Sonoma and Marin Counties, but, as of yet, has not petitioned for recognition by the Alcohol and Tobacco Tax and Trade Bureau (TTB) as an AVA. The Petaluma Gap area has a rich history of viticulture, with documented vineyards and winemaking dating back to at least the mid-1800s (see **Section 2.0,** Viticultural History of the Petaluma Gap). The name is already commonly used by media outlets and wine writers as well as the local wine industry (see **Section 3.0,** Name Evidence).

Located in southern Sonoma County and northern Marin County, California, the Petaluma Gap is best known for its wind, which allows for direct access to coastal marine air and fog. The area's topography, with rolling hills below 1000 feet in elevation, offers this access.

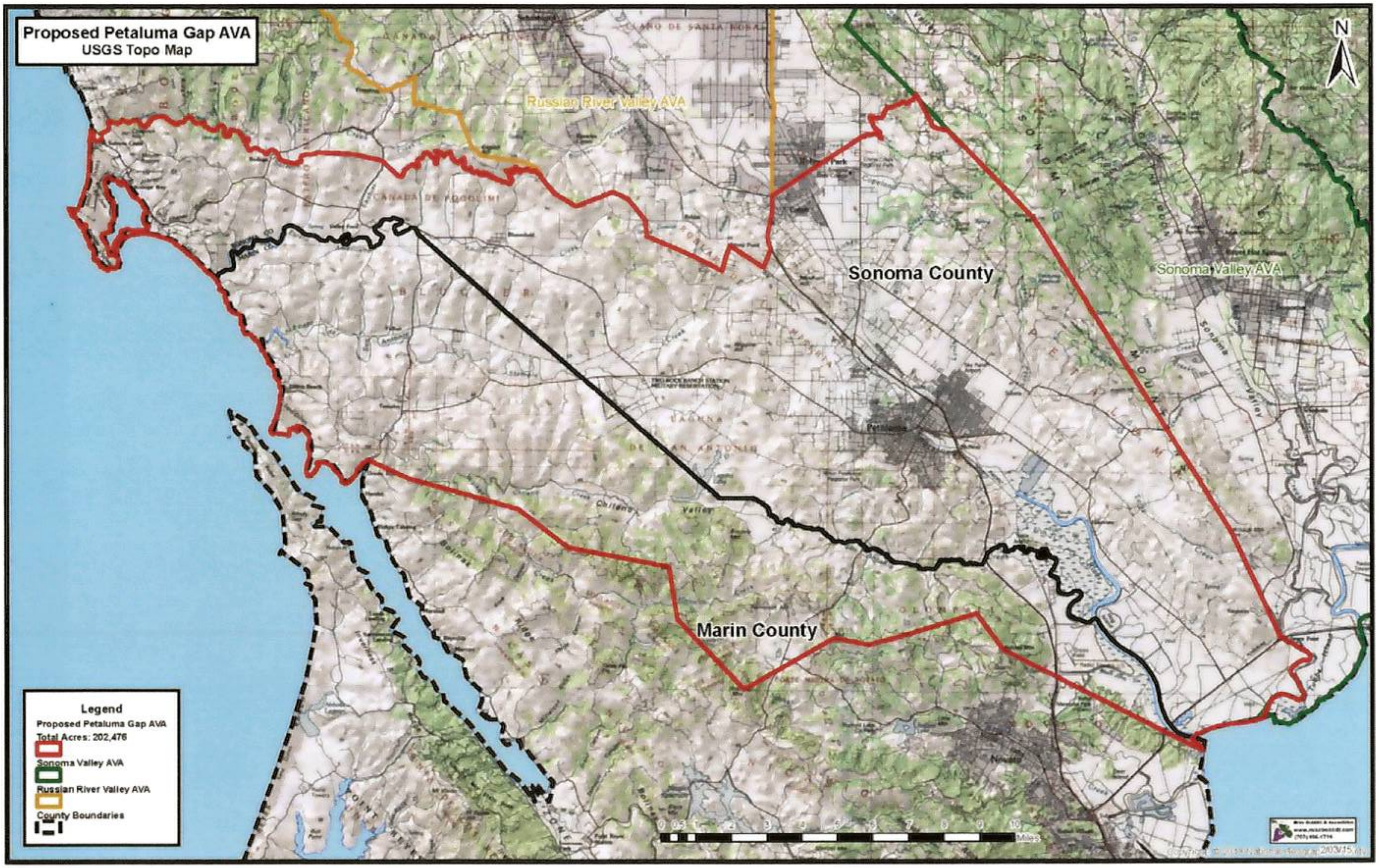
This petition provides a geographical and climatological review of the Petaluma Gap and compares and contrasts it with other viticultural areas within Sonoma County. As part of the Petaluma Gap is within the Sonoma Coast AVA, comparisons and distinctions are also be made in relationship to other areas within the Sonoma Coast AVA as well as Marin County to the south (see **Table 1**). Further, overlaps outside the Sonoma Coast AVA and North Coast AVA are addressed. Finally, recommended boundaries are proposed to best apply the viticultural area to the characteristics that best define it. **Map 1** illustrates the proposed boundaries of the Petaluma Gap AVA.

Table 1. Distinguishing Characteristics of the Petaluma Gap Relative to Surrounding Areas

	Petaluma Gap	North (west)	North (east)	East	South (Marin)
Topography	Rolling hills, generally below 1000 feet ASL	Mountainous	Plain	Mountainous and broad valley	Mountainous
Geology	Mostly Wilson Grove Formation with Franciscan mélange, and Quaternary deposits	Mostly Franciscan assemblage with Wilson Grove Formation	Wilson Grove Formation and Quaternary deposits	Sonoma Volcanics, Franciscan assemblage, Huichica Formation and Quaternary deposits	Mostly Franciscan assemblage
Microclimate	Cool coastal climate with frequent and sustained afternoon wind speeds ≥ 8 mph	Cool coastal climate with much lower wind influence	Cool coastal climate (slightly warmer than Petaluma Gap) with afternoon winds of lower speed common	Cool coastal to warmer coastal climates	Cool coastal climate with more varied wind influence
Soil	Sedimentary parent material and alluvial. Common series include: Steinbeck/Tomales and Clear Lake	Sedimentary parent. Common series include Goldridge and Hugo	Alluvial and sedimentary parent. Common series include Goldridge and Clear Lake	Volcanic parent and alluvial. Common series include Goulding, Red Hill, Huichica, and Haire	Sedimentary parent. Common series include Tomales and Diablo
Common varietals	Pinot Noir, Chardonnay, and Syrah	Pinot Noir and Chardonnay	Pinot Noir and Chardonnay; some warmer climate varietals (Cabernet Sauvignon, Merlot and Zinfandel) toward the NE corner	Pinot Noir and Chardonnay less common; more warmer climate varietals (Cabernet Sauvignon, Merlot and Zinfandel)	Chardonnay and Pinot Noir. Viticulture less common.
Existing AVAs	North Coast, Sonoma Coast, (partial)	North Coast, Sonoma Coast	North Coast, Sonoma Coast, Northern Sonoma, Russian River Valley; Bennett Valley toward the NE corner	North Coast, Sonoma Coast, Sonoma Valley, Bennett Valley, Los Carneros, Sonoma Mountain	North Coast (partial)

Note: The Pacific Ocean is along the west boundary of the Petaluma Gap.

Map 1. Proposed Petaluma Gap AVA



SECTION 2.0
VITICULTURAL HISTORY OF THE PETALUMA GAP

In 1989, Sonoma County historian William F. Heintz conducted an extensive investigation that researched the history of viticulture and winemaking in the Petaluma area from its earliest beginnings.[1] Much of the information that follows is summarized from that document.

In the mid-1800s, vineyards were prevalent throughout rural Petaluma. The thriving Victorian riverfront city served as a watering hole, as well as a shipping channel to transport mining supplies, grains and other food products for the miners heading to the hills in search of gold. Situated on a waterway that provided year-round transportation to San Francisco, Petaluma was a natural location for producing and shipping wine, and wine traveled from warehouses in the downtown district of Petaluma, along the river, to San Francisco and beyond. Vineyards sprang up in the area, producing wine for both locals and the hordes of "'49ers" that were flocking to San Francisco and the Sierras.

The early wine pioneers might not be as well-known as those who founded the more famous vineyards further north or east, but the names of William Bihler, John G. Staedler and James G. Fair were big news during a big time for wine. Staedler appears to have been the first to plant vines in or near Petaluma, in the early 1860s. William Bihler planted vines on the banks of Petaluma creek, on the adjacent hillsides, and in the Lakeville area about 1878. Many vines found their way here in the form of old-world rootstock, smuggled in by Italian, French, German, Swiss and other immigrant European settlers and initially intended for their own "house wine." The mix of grape varieties mentioned in early accounts were Zinfandel and Alicante Bouschet.

Petaluma's first winery was founded in 1884 by G. V. Fischer. He took over an abandoned brewery to handle his first crush. There were also two wineries in the Lakeville area at that time. The largest was owned by James G. Fair — a U.S. Senator from Nevada, a famous silver baron, and the man who built the Fairmont

[1] *Wine and Viticulture History in the Lakeville District, Petaluma, Sonoma County, CA.* William F. Heintz, Sonoma, CA. February 1989.

Hotel in San Francisco. Fair's winery was located in General Vallejo's old brick armory on Lakeville Road, now part of Hendricks Ranch (and within the proposed Petaluma Gap AVA). By 1893, the winery had a 600,000 gallon capacity, making it one of the largest in the state. The second Lakeville winery was built in the mid-1890s and operated nearly half a century. Three brothers named Raffaelli founded the winery but willed it on their death to a ranch worker named Marcucci. The Marcucci Ranch (also within the proposed Petaluma Gap AVA) still has some of the original winery buildings on the property.

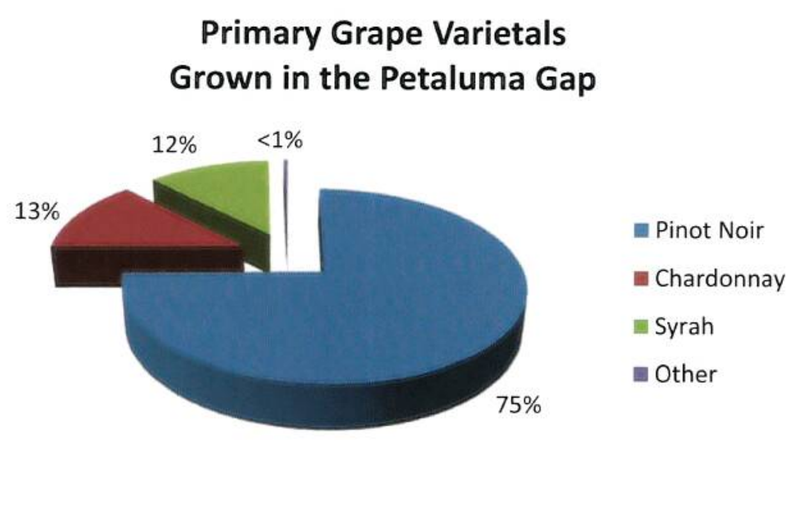
The Heintz report also documents early grape growing in the area west of Petaluma. An article in the Sonoma Democrat of October 15, 1881 describes "... a wagon load of grapes grown on the farm of J.W. Cassidy on the Bloomfield road about two miles [west] from Petaluma."

By the late 1870s the French wine industry was facing near extinction. An infestation of a root-born aphid called "phylloxera" was killing the vines. There was talk that California might replace France as the major producer of wine. With vineyard land available for $15 to $25 per acre, and the likelihood of making lots of money from growing grapes and producing wine, more and more vines were being planted. In just a decade, vineyard acreage more than quadrupled and the number of wineries did the same.

In the early 1900s, in the Petaluma area alone, there were at least 1,000 acres of grapevines. Then came the dark ages of Prohibition and our own battle with phylloxera here in California. A further blow to the Petaluma area wine industry came with Prohibition in 1919. By the time Prohibition ended, what had been a rapidly growing industry was reduced to near wreckage. James Fair had purchased the Bihler vineyards in 1891, but he died in 1894. His sons sold what remained. Only one vineyard planted before the turn of the century, owned by the Marcuccis, survived until 1965.

But that was the past, and slowly the vines have crept back, often taking the place of cattle, sheep and chickens in Petaluma's agricultural economy. Most plantings that have propelled the Petaluma Gap wines to their current levels of fame have taken place since the early 1990s. Today there are approximately 4,000 acres of planted and productive vineyards across approximately 80 vineyards in the Petaluma Gap. Vineyards range in size from less than 5 acres to nearly 500 acres, with the majority (by number) in the 5 to 20 acre range. The small vineyards are tucked into valleys and hillsides often nestled in with cattle, sheep, chickens, and other agriculture.

Of the approximately 4,000 planted acres, approximately 75 percent is planted to pinot noir, 13 percent to chardonnay, and 12 percent to syrah. Other varietals such as pinot gris, viognier, and tempranillo comprise less than 1% of the planted acreage.



The **Petaluma Gap Winegrowers Alliance (PGWA)** was formed in 2005 by a group of local growers/vintners as a forum for sharing information and experiences of growing wine grapes in the windy, cool-climate area of Petaluma. As more vineyards were planted and word of the ad-hoc organization spread, participation in the monthly meetings began to grow. In 2008, the PGWA first filed for incorporation as a California nonprofit public benefit corporation. In 2011, that filing was amended and the organization sought incorporation under California's Nonprofit Mutual Benefit Corporation Law, which was ultimately approved. Today, the PGWA's membership consists of approximately 45 Industry members (growers and wineries/wine brands), 25 Associate Members (non-wine businesses), and 116 Friends (primarily members of the general public). The Mission of the PGWA is to:

- Promote the winegrowers and vintners within the Petaluma Gap and foster the production of high-quality wines crafted from Petaluma Gap grapes;
- Cultivate positive relationships within the community by elevating awareness of growing and winemaking practices and an understanding of the winegrowers' commitment to respect and protect the land; and
- Continue to advance Petaluma's 150-year heritage as a successful wine-producing center.

SECTION 3.0
NAME EVIDENCE

3.1 Non-Viticultural Evidence

Perhaps no viticultural area not officially recognized as an AVA by the TTB is as well-known as the Petaluma Gap. The name is already used regularly in media reports, including those specific to wine and viticulture, by local growers, and by government agencies. The city of Petaluma sits almost precisely in the middle of the proposed Petaluma Gap AVA.

However, use of the term "Petaluma Gap" actually predates its use to describe a viticultural region. The Bay Area Air Quality Management District (BAAQMD), for example, states on its website:[2]

> "The region from the Estero Lowlands to the San Pablo Bay is known as the Petaluma Gap. This low-terrain area is a major transport corridor allowing marine air to pass into the Bay Area. Wind patterns in the Petaluma and Cotati Valleys are strongly influenced by the Petaluma Gap"

This climatological use of Petaluma Gap by the BAAQMD dates back to at least 1999.[3] An even older climatological use is demonstrated in the following quote from the University of California Cooperative Extension dating from 1986:[4]

> MARINE: The marine zone is under direct ocean influence, lying west of the first mountain ridges of the coast below 1,000 ft. and extending inland through river canyons and the Petaluma gap to Sonoma Mountain.

3.2 Viticultural Evidence

Over the past decade, the name Petaluma Gap has become inseparable from the viticulture and wine industry in the area. A great many articles and wine reviews have built upon the topographical and climatological aspect of the term to express the primary characteristic that distinguishes the region viticulturaly. Provided below are brief summaries of just a few of the many relevant articles that connect the term Petaluma Gap with the area's unique viticultural characteristics.

Tom Wark, May 8, 2006, "Wind, Fog, Wine: The Story of "The Gap"", The Daily Wine Blog

The Petaluma Gap is a 15 mile wide "gap" in the coastal range mountains in southern most part of the Sonoma County AVA. It is known for cultivating the most delicate varietals such as Pinot Noir and

[2] http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Bay-Area-Climatology/Subregions/Cotati-and-Petaluma-Valleys.aspx

[3] BAAQMD CEQA GUIDELINES: Assessing the Air Quality Impacts of Projects and Plans. Prepared by the Planning and Research Division of the Bay Area Air Quality Management District. December 1999.

[4] Vossen, Paul, *Sonoma County Climatic Zones*, University of California Cooperative Extension Service, Sonoma County, 1986.

Chardonnay due to the unusual winds and microclimate. The wines tend to be crisper, higher in acid, and offer more fruit forward flavors.

Rusty Gaffney, January 15, 2007, "Petaluma Gap: Noir Fog", Pinot File, Volume 6, Issue 12

The Petaluma Gap is a narrow opening in the southern Sonoma County countryside connecting the ocean near Bodega Bay and Tomales to the San Francisco Bay. It is roughly 22 to 31 miles in width. The western edge runs approximately from Tomales to Bodega. The southern border is Nicasio and the north and east border starts around Penngrove/Cotati and runs southeast along the Carneros Ridge ending in San Pablo Bay. The area currently has about 1,000 acres of planted vineyards growing cool climate varietals such as Pinot Noir and Chardonnay, but you also see Syrah. The area has been compared to already established AVAs such as Carneros and Santa Cruz Mountains but with an unusual twist: It possesses a unique microclimate in which you see early morning fog, followed by a midday heat and a drop in temperature, making for a very cool evening.

Heather Irwin, August 2007, "Sonoma County's Best Kept Pinot Noir Secret", The Wind Tunnel

A town of Petaluma that is known for its butter and eggs is slowly emerging as a unique wine region as well. Over the past 10 years, many wineries have been established on retired dairy and chicken farms. The Petaluma gap is different from its neighboring AVAs because of the morning fog and costal winds that drop the temperature nearly 15 degrees in the evening. The cooler temperatures allow the fruit to hang on the vines longer than other regions - about three to four weeks. Longer hang time gives the grapes more time to ripen and intensify without adding sugar.

Christopher Sawyer, February 2008, "Mind the [Petaluma] Gap", the Tasting Panel

The foggy mornings, warm afternoons, and chilly maritime winds of the evening in the Petaluma Gap make it a great place for growing the delicate Pinot Noir varietal. The Petaluma Gap is creating age-worthy wines with "explosive flavors of mixed berries, ripe plums, red currants, dark cherries, fresh ruby grapefruit, pomegranate, zesty spices, and lingering hints of smoke and earth". These flavors are attained due to the fact that the microclimate allows for the grapes to hang on the vines for a longer period of time before they are harvested.

Linda Murphy, March 2010, "California's Coolest Pinot", Decanter.com

An area that was once thought to be too cold for grape growing is now emerging as one of the best Pinot Noir regions on California. The Petaluma Gap, located in the southern part of the Sonoma Coast AVA, is known for producing Pinot Noirs with silky tannins, refreshing acidity, and age-ability. The flavors are developed because of the foggy mornings, warm afternoons and cool, windy evenings where the fog envelops the vineyard again.

Von Hurson, August 11, 2012, "The Gap Roars!", The Petaluma Post[5]

The Petaluma Gap has not been granted its own specific AVA, so wines from this region are hardly given the recognition they deserve for their quality. It takes events such as the one in 2011 when Wine Spectator Magazine selected the Kosta Browne Pinot Noir, Sonoma Coast AVA, as the Wine of the Year. It was the first Sonoma County wine to win the award since 1999 and the first ever Pinot Noir wine to win. Wine Spectator editors tasted and reviewed over 16,000 new releases from 12 countries and two of

[5] http://www.petalumapost.com/08Aug2012-pages/smallPDFAug2012/11.pdf

the three vineyards that went into the winning blend were both Petaluma Gap vineyards. Wines produced from Petaluma Gap vineyards are currently labeled as "Sonoma Coast AVA" wines, but wines from this region are so much more complex than the rest of the Sonoma Coast AVA wines. There are two attributes that make the region unique: the wind and the fog. When referring to the Petaluma "Gap" they are regarding an actual Wind Gap. This gap is a narrow opening in the southern Sonoma County countryside – named after a coastal mountain opening that stretches from the Pacific – east through the town of Petaluma and then continues south to San Pablo Bay. This allows for growing seasons consisting of cool foggy mornings, intense heat in the midday, followed by cool breezes from the Pacific Ocean in the late afternoon, and leading to very cool nights.

Steve Heimoff, Nov 6, 2013, "How the French once hated California wine; and a Petaluma Gap AVA", Steve Heimoff Wine Blog[6]

It was not until recently that French winemakers began to respect California born wine and not see it as merely a copycat of their own winemaking practices. This new regard for wine that is made in California is being shared all throughout the world. The Petaluma Gap is a region that deserves its own worldly recognition. Much like other famous wine regions in California, such as Sonoma and Napa, the Petaluma Gap produces wonderful wines. It is unique cool-climate area that produces important Pinot Noir, Chardonnay and other grapes such as Syrah. As of now, wine produced in the Petaluma Gap is clumped into the very large Sonoma Coast AVA. It is about time that the Petaluma Gap stands apart from the other wineries in the Sonoma Coast AVA.

Virginie Boone, February 4, 2014, "Wines of Wind Country", The Press Democrat[7]

The Petaluma Gap has grapes that are sourced by such diverse producers as Kosta Browne, Arnot-Roberts, Bedrock, La Follette, Wind Gap and Williams Selyem. Marked by pronounced fog in the morning, the Petaluma Gap enjoys midday sun and afternoon wind that blows over the vines. As a result, the grapes tend to develop thicker skins, retain higher acidity and, thanks to substantial hang time, powerful flavors. Pinot noirs from the Gap are known to exhibit flavors of rich red and blue fruit alongside savory spice and wild herbs, while chardonnay often is fairly bright in acidity, more tart than sweet. But it's the Syrah that is most often revelatory, offering a cool-climate temperament that's as much about structure as power, with flavor highlights of white pepper.

3.3 Conflicting or Confusing Use

A search of the Geographic Names Information System from the USGS Board on Geographic Names provides no results for the query "Petaluma Gap," which means the name is not in this database. Further, because (a) the name derives from the city of Petaluma (established in 1858) and (b) the topographical feature (the wind gap) is so strongly associated with Petaluma, it is unlikely that any other geographic area would be known by this name. No conflicting uses are known to exist. Also, as clearly established above, the name Petaluma Gap has been associated with viticulture and wine from the Petaluma area for over a decade. Consequently, approval of the Petaluma Gap AVA would not result in any marketplace or consumer confusion.

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6 http://www.steveheimoff.com/index.php/2013/11/06/how-the-french-once-hated-california-wine-and-a-petaluma-gap-ava/#sthash.qK4ytrtA.dpuf

7 http://www.pressdemocrat.com/news/1855471-181/wines-of-wind-country

SECTION 4.0
BOUNDARY EVIDENCE

4.1 Topography

The Petaluma Gap is most noted for consistent winds blowing in from the Pacific Ocean through the Petaluma wind gap, but perhaps topography (a key component to these winds) offers the greatest distinction of this area from surrounding areas. From approximately Salmon Creek north of Bodega Bay to Walker Creek at Tomales Bay to the south, the coastal highlands that are characteristic along the California coast are not nearly as pronounced. Many Sonoma County coastal mountains north of this area experience elevations above 800 feet, with elevations above 1000 feet being common.[8] Even higher ridgelines are found in Marin County to the south. Meanwhile, within this approximate 18 mile (30 km) stretch of coastline (direct aerial distance of 12.5 miles or 20 km), no topographic barrier along the coast is higher than 600 feet in elevation. The area is not flat, with many rolling hills, some of which are steep in places, but the topography is generally lower (**Photo 1**). This rolling terrain runs in an east-west orientation, eventually shifting to a more northwest-southeast orientation along either side of U.S. Highway 101 (**Map 2**). The net result is a corridor for coastal winds moving inland. This path is blocked by Sonoma Mountain to the east of Petaluma (**Photo 2**). To the southeast, approximately 33 miles (53 km) from the Pacific Coast at the Marin/Sonoma county line, the corridor of lower elevations allows a path directly to San Pablo Bay. To the north of Petaluma, the wind gap branches to the north into the Cotati Valley and onto the Santa Rosa Plain (also known on U.S.G.S. topographic maps as the Llano de Santa Rosa). North along the coast, the highlands west of Occidental reach elevations above 1000 feet. Further to the east, the Santa Rosa Plain is marked by significantly flatter terrain than the rolling hills of the Petaluma Gap. To the east of the Petaluma Gap, Sonoma Mountain reaches an elevation of 2,295 feet. To the south of Petaluma Gap, various ridgelines reach over 1000 feet in elevation, starting with the Bolinas Ridge in the west to Burdell Mountain (1,558 feet) closer to San Pablo Bay.

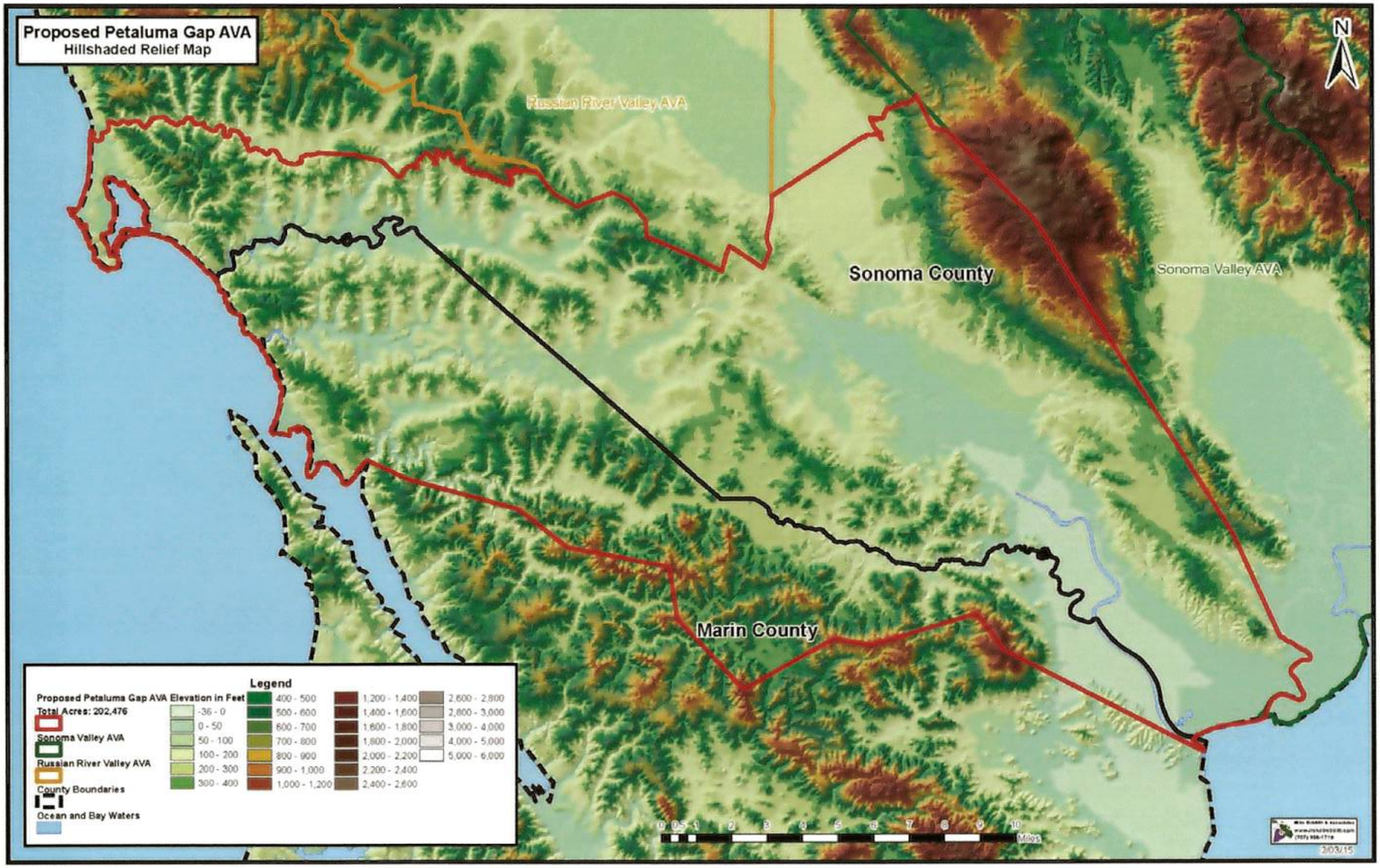
This topography allows coastal influences to infiltrate the Petaluma Gap relatively unhindered. Marine airflow also is important to the Russian River Valley AVA and the Green Valley of the Russian, but this flow filters in through the Russian River Valley to the north and from air diverted north from the Petaluma Gap onto the Santa Rosa Plain. The Sonoma Valley, with temperatures moderated by marine airflow, experiences airflow from the Petaluma Gap via the Santa Rosa Plain to the north and from San Pablo Bay to the south. The Bennett Valley AVA experiences some marine cooling, but this air spills over several passes from the Santa Rosa Plain into the Bennett Valley. Hence, marine airflow filters in to other local viticultural areas through restricted access points, even in the Russian River Valley which is greatly influenced by this marine air. While a number of access points exist for marine air flowing inland along the Sonoma and Marin coast, the Petaluma Gap is the largest, most unrestricted of these access points, and viticulture with the Petaluma Gap experiences the full effect of this intruding air.

[8] Because U.S.G.S. 1:24,000 scale maps will be utilized for the boundary descriptions, all elevation units utilize the English system of measurements.

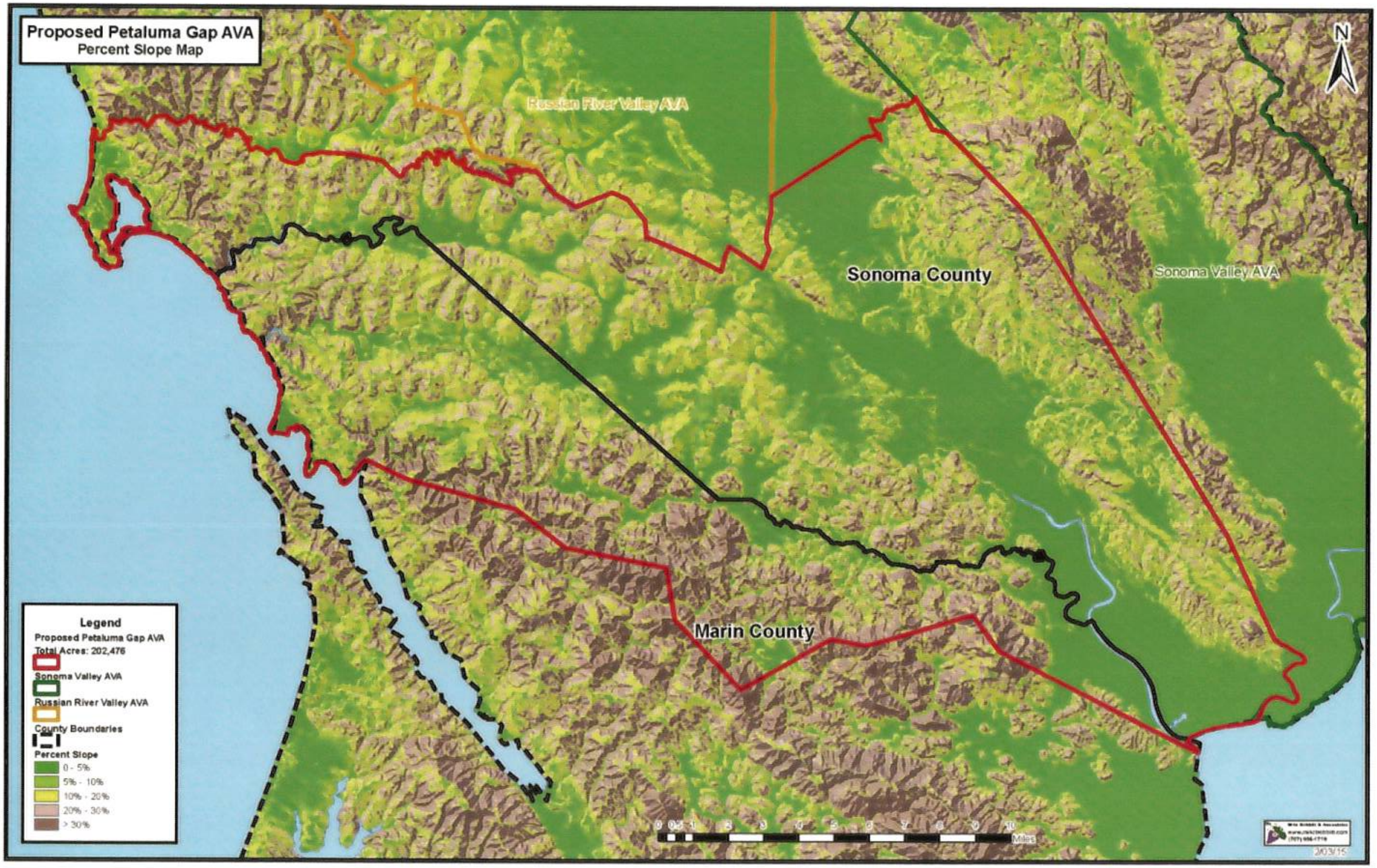
Photo 1. In this view, looking west from Meacham Hill (northwest of the summit) toward the Pacific Ocean, rolling hills dominate the Petaluma Gap landscape.

Photo 2. Looking east from near Hammock Hill, Sonoma Mountain can be seen in the distance. Taken at 726 feet, this photo is from one of the highest points within the Petaluma Gap (excluding the confining ridgelines).

Map 2. Terrain Map of the Petaluma Gap AVA (shaded relief)



Map 3. Slope Map of the Petaluma Gap AVA (percent slope)



While the terrain of the Petaluma Gap is better defined as rolling hills than mountainous, flatland is limited (**Map 3**). The most flatland is found along the Petaluma River, especially in the eastern area of the City of Petaluma and the wetlands to the southeast as the river approaches its mouth at San Pablo Bay. Most other areas of flat terrain within the Petaluma Gap are limited to small valleys and fluvial terraces. This lack of extensive plains distinguishes the Petaluma Gap from the Santa Rosa Plain to the north and the broader valley of the southern Sonoma Valley AVA and western Los Carneros AVA to the east (**Photo 3**).

Photo 3. Photo taken from Boneau Road (west side of Sonoma Valley AVA and Los Carneros AVA), looking northeast across the southern Sonoma Valley toward the southern flank of Arrowhead Mountain. Such an open plain is not common to the Petaluma Gap.

4.2 Geology

The topography of the Petaluma Gap is in many ways the result of underlying geology, along with drainage patterns, climatic variations, and biological influences. The Petaluma Gap area comprises a variety of geologic formations, a result of tectonic subduction and later faulting, causing accretion of different geological materials. Most common in the western part of the viticultural area is the Wilson

Grove Formation (formerly known as the Sebastopol Merced Formation[9]) of claystone, siltstone and fine standstone,[10] overlying Franciscan sedimentary rock. Interspersed among the Wilson Grove Formation is a Franciscan mélange of sandstone and shale. The Franciscan mélange is much more common to the north of Bodega Bay and to the south of Walker Creek, and, in that regard, geology helps distinguish the area from other coastal areas of the Sonoma Coast AVA and from other locations within Marin County. The eastern sections of the viticultural area are home to greater Quaternary deposits of varying ages and origination including Pliocene marine deposits, landslide deposits, and alluvial deposits. The geology of Sonoma Mountain is mostly that of uplifted volcanic material, which is common to the Sonoma Mountains and the Mayacamas Mountains further to the east. Where sedimentation is found in the Sonoma Valley, a greater presence of sediment from volcanic parent material exists.

Hence, geology helps further distinguish the Petaluma Gap from surrounding viticultural areas. The California Department of Water Resources, for example, notes "the contact between the Franciscan and Wilson Grove Formation defines the Basin boundary on the north,"[11] referring to the groundwater basin that closely approximates much of the Petaluma Gap viticultural area. The correlation, however, is far from a perfect match. As noted above, areas of Francican mélange are found within the Wilson Grove Formation in the Petaluma Gap. Similarly, the Wilson Grove Formation extends into the Russian River Valley AVA along the Sebastopol Hills. Meanwhile, Quaternary deposits define the Santa Rosa Plain also within the Russian River Valley, as well as the valley floor of the Sonama Valley. As a generalization, a safe assessment of the role geology plays in defining the Petaluma Gap AVA is that the Wilson Grove Formation is much more predominant in the Petaluma Gap, and has likely played a major role in the development of the topography.

4.3 Soils

A review of soils is complicated by the multiple counties involved. A complete Soil Conservation Services (National Soil Resources Conservation Service - NRCS) soil survey of Sonoma County was published in 1972, while a similar soil survey of Marin County was published in 1985. With the ongoing evolution of US Soil Taxonomy classifications, soils with very similar characteristics may have received different classifications between the two soil surveys. This scenario seems to be case with Steinbeck Loams (Sonoma County) and Tomales Loams and Tomales-Steinbeck Loams (Marin County). Steinbeck Loams are described by NRCS as "fine-loamy, mixed, superactive, mesic Ultic Haplustalfs" and are further noted as consisting of "deep, well drained soils that formed in material weathered from soft sand-stone. Steinbeck soils are on smooth rolling hills and have slopes of 2 to 50 percent. The mean annual precipitation is about 30 inches and the mean annual temperature is about 55 degrees F [*sic*]." This description is very similar to that of Tomales soils, defined as "fine, mixed, superactive, mesic Ultic Paleustalfs" consisting of "deep, moderately well drained soils that formed on strongly weathered, soft sandstone. Tomales soils are on smooth, rolling hills. Slopes are 2 to 50 percent. The mean annual

[9] California Department of Water Resources, "North Coast Hydrologic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated, June 14, 2014.

[10] Huffman, Michael E., *Geology for Planning on the Sonoma Coast Between the Russian River and Estero Americano*, California Division of Mines and Geology in cooperation with the Sonoma County Planning Department, 1973. Description based on Merced formation.

[11] California Department of Water Resources, "North Coast Hydrologic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated June 30, 2014.

precipitation is about 30 inches and the mean annual temperature is about 54 degrees F [*sic*]."[12] A few subtle differences are noted between these soil types, including typical pedon (northeast slopes for Tomales series soils compared to southwest slopes for Steinbeck series soils), but the soil series are so similar that Steinbeck series soils have been classified with Steinbeck-Tomales soils in this petition.

Other soil series may be combined between the counties to simplify the number of soil types present, but collectively Steinbeck/Tomales (including Tomales) series soils are the most common to the Petaluma Gap covering 24.0% of the proposed AVA. Even with further simplification, the diversity of soil types present indicates that soil does not play a predominant role in defining the proposed AVA (**Map 4**). A few generalizations are possible. The Steinbeck/Tomales soils are dominant in the western part of the Petaluma Gap, while Goldridge, Hugo, and Sebastopol series soils tend to dominate areas around Occidental and Sebastopol to the north of the Petaluma Gap. Cotati and Haire series soils are the most common in the eastern part of the Petaluma Gap, while soil series common to the Clear Lake-Reyes and Huichica-Wright-Zamora associations are found in to the Santa Rosa Plain and Goulding, Toomes, Red Hill, and Huichica soils are more common to the Sonoma Valley. The correlation of soil series to other characteristics defining the different viticultural areas, however, is far from precise.

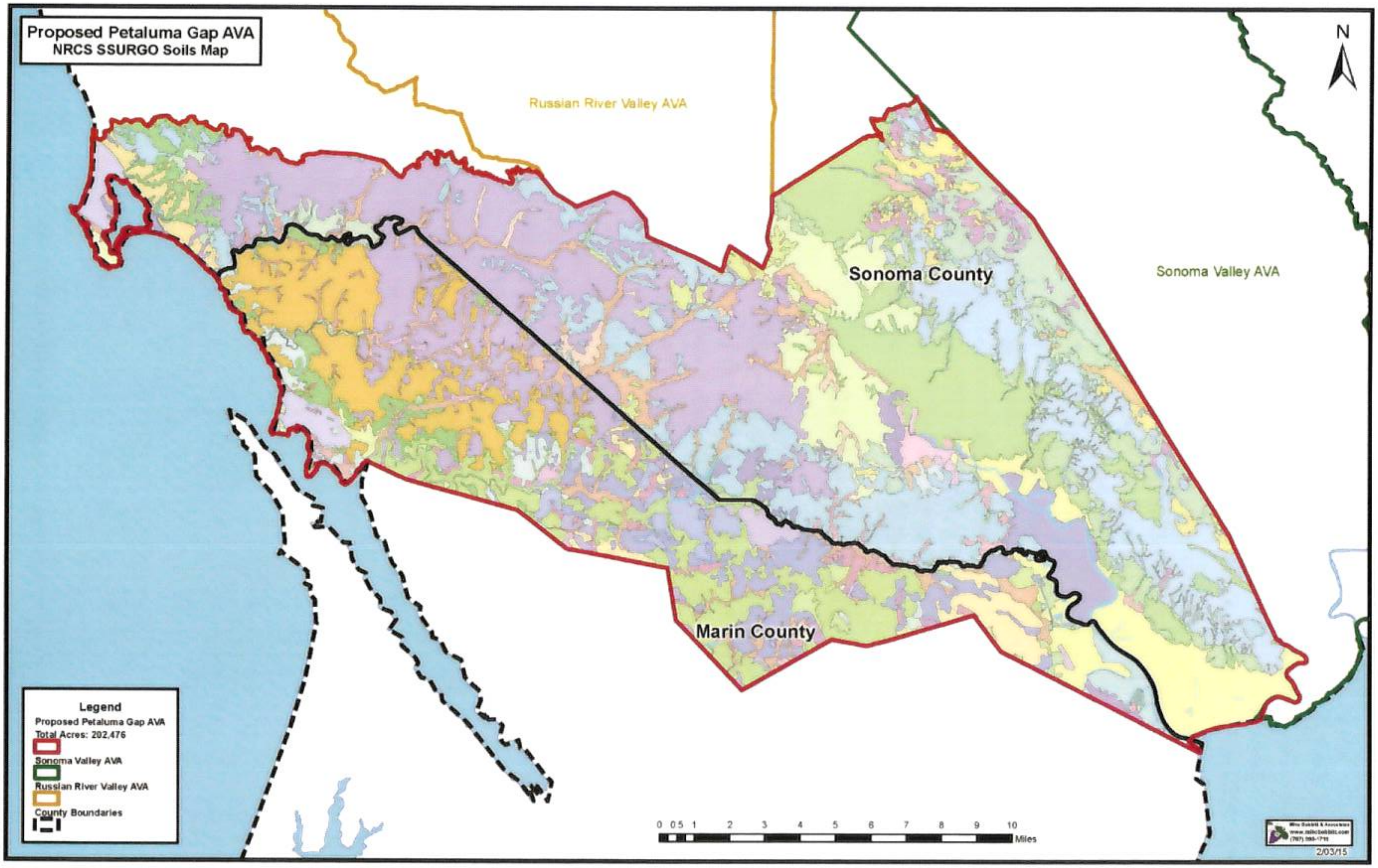
4.4 Watershed and Groundwater

Drainage from throughout the Petaluma Gap either flows into the Pacific Ocean via various streams or to San Pablo Bay primarily via the Petaluma River. Most of the Pacific drainage is through Americano Creek, Stemple Creek, Walker Creek, or Salmon Creek to the north. Watershed is significant in that it has been used to distinguish the Russian River Valley AVA. A small portion of the proposed Petaluma Gap AVA falls within the Russian River watershed in the northeastern-most extent of the area, but other geographic characteristics distinguish this area from the Russian River Valley AVA. Further, the Sonoma Valley AVA to the east drains to either Sonoma Creek or Santa Rosa Creek, which eventually drains into the Russian River Valley. Other than the related topography affecting drainage, watershed has little bearing on viticulture in the area. As is the case with the Russian River Valley noted earlier, drainage can play a role in name recognition. In the case of the Petaluma Gap, however, airflow more than drainage offers the greatest attribute associated with the name.

Groundwater drainage, a result of underlying geology, weathering, and soil permeability, more closely identifies with the Petaluma Gap viticulture. Most of the Petaluma Gap falls within the Wilson Grove Formation Highlands Groundwater Basin as defined by the California Department of Water Resources. This basin is identified as follows:

[12] All soil descriptions are official soil descriptions as identified on the NRCS website.

Map 4. NRCS Soils Series of the Petaluma Gap AVA[13] (soils legend is on the following page)



[13] Steinbeck and Tomales-Steinbeck loams have been consolidated into Tomales-Steinbeck.

Map 4 Legend and Table. NRCS Soils Series of the Petaluma Gap AVA

Legend

NRCS SSURGO Soils (Reclassified)

Marin & Sonoma County Soils Surveys

- ALLUVIAL LAND
- ARBUCKLE GRAVELLY LOAM
- BALLARD GRAVELLY
- BARNABE VERY GRAVELLY LOAM
- BAYWOOD LOAMY SAND
- BEACHES
- BLUCHER
- BONNYDOON GRAVELLY LOAM
- BONNYDOON VARIANT-GILROY-GILROY VARIANT LOAMS
- BRESSA VARIANT-MCMULLIN VARIANT COMPLEX
- CLEAR LAKE
- COASTAL BEACHES
- CORTINA
- COTATI FINE SANDY LOAM
- DIABLO CLAY
- DUNE LAND
- FELTON VARIANT-SOULAJULE COMPLEX
- FLUVENTS
- GILROY-GILROY VARIANT-BONNYDOON VARIANT LOAMS
- GOLDRIDGE FINE SANDY LOAM
- GOULDING
- GOULDING-TOOMES COMPLEX
- GULLIED LAND
- Gravel Pits
- HAIRE
- HELY SILT LOAM
- HENNEKE STONY CLAY LOAM
- HYDRAQUENTS
- KIDD STONY LOAM
- KINMAN LOAM
- KINMAN-KNEELAND LOAMS
- KNEELAND
- KNEELAND ROCKY COMPLEX
- KNEELAND ROCKY SANDY LOAM
- LANIGER LOAM
- LOS GATOS LOAM
- LOS OSOS CLAY LOAM
- LOS OSOS-BONNYDOON COMPLEX
- MONTARA
- NOVATO CLAY
- OLOMPALI LOAM
- PAJARO
- PITS
- PLEASANTON
- RAYNOR CLAY
- REYES CLAY
- REYES SILTY CLAY
- RIVERWASH
- ROCK LAND
- ROCK OUTCROP-XERORTHENTS COMPLEX
- RODEO CLAY LOAM
- ROHNERVILLE LOAM
- SAURIN-BONNYDOON COMPLEX
- SEBASTOPOL SANDY LOAM
- SHERIDAN COARSE SANDY LOAM
- SIRDRAK SAND
- SOBEGA LOAM
- SOBRANTE LOAM
- STONYFORD GRAVELLY LOAM
- TERRACE ESCARPMENTS
- TIDAL MARSH
- TOCALOMA-MCMULLIN COMPLEX
- TOCALOMA-SAURIN ASSOCIATION
- TOMALES LOAM
- TOMALES-STEINBECK
- TOOMES ROCKY LOAM
- URBAN LAND-XERORTHENTS COMPLEX
- WATER
- XERORTHENTS
- XERORTHENTS-URBAN LAND COMPLEX
- YOLO CLAY LOAM
- YORKVILLE CLAY LOAM
- YORKVILLE-ROCK OUTCROP COMPLEX
- ZAMORA SILTY CLAY LOAM

Soil Type	Acres	Percent
TOMALES-STEINBECK	35,789.5	17.7%
LOS OSOS CLAY LOAM	17,480.9	8.6%
CLEAR LAKE	16,759.4	8.3%
DIABLO CLAY	15,158.4	7.5%
TOMALES LOAM	12,704.6	6.3%
TOCALOMA-SAURIN ASSOCIATION	10,637.1	5.3%
BLUCHER	9,239.1	4.6%
COTATI FINE SANDY LOAM	8,091.4	4.0%
REYES SILTY CLAY	7,400.1	3.7%
LOS OSOS-BONNYDOON COMPLEX	6,861.8	3.4%
GOULDING	6,751.3	3.3%
HAIRE	3,814.6	1.9%
TIDAL MARSH	3,549.6	1.8%
TOCALOMA-MCMULLIN COMPLEX	3,094.7	1.5%
GOULDING-TOOMES COMPLEX	2,614.6	1.3%
SOBEGA LOAM	2,428.2	1.2%
DUNE LAND	2,288.9	1.1%
YORKVILLE CLAY LOAM	2,201.2	1.1%
FELTON VARIANT-SOULAJULE COMPLEX	2,129.4	1.1%
WATER	2,101.2	1.0%
KNEELAND ROCKY COMPLEX	1,997.7	1.0%
RAYNOR CLAY	1,882.9	0.9%
REYES CLAY	1,742.8	0.9%
SAURIN-BONNYDOON COMPLEX	1,678.4	0.8%
ROHNERVILLE LOAM	1,621.6	0.8%
PAJARO	1,510.7	0.7%
LANIGER LOAM	1,506.8	0.7%
GULLIED LAND	1,489.2	0.7%
NOVATO CLAY	1,438.7	0.7%
ARBUCKLE GRAVELLY LOAM	1,430.1	0.7%
SEBASTOPOL SANDY LOAM	1,405.1	0.7%
KNEELAND	1,098.4	0.5%
ZAMORA SILTY CLAY LOAM	975.9	0.5%
BALLARD GRAVELLY	946.8	0.5%
GILROY-GILROY VARIANT-BONNYDOON VA	885.0	0.4%
YOLO CLAY LOAM	675.0	0.3%
BONNYDOON GRAVELLY LOAM	666.1	0.3%
TOOMES ROCKY LOAM	638.0	0.3%
ALLUVIAL LAND	597.1	0.3%
YORKVILLE-ROCK OUTCROP COMPLEX	566.7	0.3%
KIDD STONY LOAM	565.0	0.3%
RODEO CLAY LOAM	555.5	0.3%
XERORTHENTS	386.7	0.2%
FLUVENTS	382.7	0.2%
PLEASANTON	338.2	0.2%
BARNABE VERY GRAVELLY LOAM	329.0	0.2%
BRESSA VARIANT-MCMULLIN VARIANT CO	326.8	0.2%
MONTARA	301.2	0.1%
SOBRANTE LOAM	270.1	0.1%
OLOMPALI LOAM	265.8	0.1%
SHERIDAN COARSE SANDY LOAM	240.2	0.1%
SPRECKELS LOAM	239.0	0.1%
BONNYDOON VARIANT-GILROY-GILROY VA	216.8	0.1%
TERRACE ESCARPMENTS	195.8	0.1%
KNEELAND ROCKY SANDY LOAM	189.8	0.1%
ROCK OUTCROP-XERORTHENTS COMPLEX	166.4	0.1%
SIRDRAK SAND	142.7	0.1%
LOS GATOS LOAM	137.2	0.1%
HYDRAQUENTS	134.6	0.1%
COASTAL BEACHES	101.8	0.1%
BAYWOOD LOAMY SAND	101.5	0.1%
BEACHES	99.9	0.0%
KINMAN LOAM	96.9	0.0%
CORTINA	90.1	0.0%
HENNEKE STONY CLAY LOAM	85.8	0.0%
RIVERWASH	85.6	0.0%
URBAN LAND-XERORTHENTS COMPLEX	80.1	0.0%

2/3/15

> Wilson Grove Formation Highlands Groundwater Basin is an irregularly shaped basin in northern Marin and southern Sonoma Counties. The basin is bounded by Chileno Valley on the south, Bodega Bay on the west, and the Tolay Fault on the east. The contact between the Franciscan and Wilson Grove Formation defines the Basin boundary on the north...The cities of Sebastopol and Forestville are located in the north of the basin and the city of Petaluma is located in the south.[14]

The Petaluma Gap, as defined by this petition, extends from just north of Bodega Bay southward along the coast to just south of, or on the southern extent of, the Chileno Valley. Depending on which part of the Tolay Fault is being referred to, the proposed AVA extends just to the east of, or at the southern section of, the Tolay fault line. Further, the city of Petaluma is located within the AVA. This groundwater basin, however, extends north of the Petaluma Gap up to the cities of Sebastopol and Forestville, which place it well into the Russian River Valley AVA. Nevertheless, geology, especially as it relates to the Wilson Grove Formation and this groundwater basin, helps distinguish the Petaluma Gap from areas to the northwest, south, and east of the proposed AVA.

4.5 Climate

4.5.1 General Climatology

Because of the topography noted above, marine influences invading the interior of Sonoma County are relatively unhindered by topographic barriers. Coastal air is drawn inland by diurnal heating patterns that cause convectional circulation patterns. In that regard, the climate of the Petaluma Gap is dependent on inland heating to act as a vacuum of cooler marine air. That pattern also explains the daily cycle for which the Petaluma Gap is known. An increase in coastal winds is common in the mid-afternoon, when inland locations have received enough insolation to create warmer ground temperatures, thus warming overlying air, creating convectional uplift, and thereby creating a pressure differential that draws in denser air off of the ocean. This daily attraction of coastal air into the interior of California is well known up and down the state's coast, but it plays an especially important role in Sonoma County viticulture.

The Petaluma Gap is located in a Mediterranean climate, with a winter rainy season, dry summers, and a long growing season. Because rainfall associated with cyclonic weather patterns are practically non-existent in the summer months, nor are thunderstorm activity or monsoonal weather patterns common, any stratus cloud layer is almost always associated with a marine inversion up to about 900-1000 feet in elevation. This marine inversion has a significant cooling effect along the coast, and often results in variations in high temperatures that can easily reach 30F°, sometimes 40F°, between coastal locations and inland locations. Some storm activity is found in April and May, but such activity is uncommon July through October. Because high pressure off the Pacific Coast often breaks down in late September and October, the marine inversion often gives way to offshore wind patterns during these months. This pattern reduces the presence of fog and often keeps temperatures warmer through September. The average high temperature in Petaluma, for example, is 81°F for September, only one degree cooler than

[14] California Department of Water Resources, "North Coast Hydrologic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated June 30, 2014.

the average high temperature for August (82°F).[15] The lack of storm activity in the area means that coastal fog is the dominant factor in the region's climatic variations.

4.5.2 Fog Intrusion

Much has been studied about fog in Sonoma County, with work on fog patterns related to viticulture known to have been studied at various times by Robert Sisson (a former Sonoma County farm advisor for the University of California Cooperative Extension), Paul Vossen (Sonoma County farm advisor for the University of California Cooperative Extension), Carol Ann Lawson (in a M.A. thesis for the University of California, Davis), Patrick Shabram (a geography professor, viticultural geographer, and author of the Shabram report in **Exhibit A**), Mike Bobbitt (a GIS specialist), Mark Greenspan (a winegrowing consultant), and Kimberly Nicholas [Cahill] (a professor and expert on the effects of climate change on agriculture) to name a few.[16] A common pattern for the movement of fog inland along the California Coast is a nocturnal marine inversion that burns off during the morning hours. Then as inland areas become warmer throughout the day, differences in local air pressure reach their peak in the middle afternoon. Hence fog commonly invades many coastal areas in the mid to late afternoon, with the marine inversion in place through the night. This pattern of coast fog intrusion has been well documented throughout California and is consistent with day-to-day fog patterns in the Petaluma Gap.

Yet, due to the variations in day to day patterns and region-wide movement of fog, average fog patterns are not completely understood. What has become increasingly clear is the importance that the Petaluma Gap plays in fog patterns throughout Sonoma County and even into Napa County and Solano County. Fog intrusions into the Russian River Valley AVA, the proposed Fountaingrove District AVA, the Sonoma Valley AVA, the Los Carneros AVA, and sub-AVAs contained within these AVAs are in part dependent on coastal air movement through the Petaluma Gap and then north on the Santa Rosa Plain and into the Sonoma Valley, or south towards San Pablo Bay and then east into the Sonoma Valley, Los Carneros, and the southern Napa Valley.

The Petaluma Gap is not the only source of marine fog invading Sonoma County. Fog intrudes through the Russian River Valley and the Golden Gate south of Marin County. The Russian River Valley AVA especially is influenced by marine air invading through the Petaluma Gap. So too is fog moving into Los Carneros and the southern Sonoma Valley likely a result of advection inversions from both the Petaluma Gap and the Golden Gate via San Pablo Bay. These inversions subsequently moderate temperatures in many other viticultural areas in the region including the Fountaingrove District, northern Sonoma Valley, and up into the Napa Valley. While the exact role that advection of marine air through the Petaluma Gap plays in region-wide cooling is unclear, what is known is that the Petaluma Gap is the primary source for most intruding cool air into most of the Russian River Valley AVA, the proposed Fountaingrove AVA, the Sonoma Valley AVA, and western Los Carneros. Where fog may not intrude, cooler air lacking condensation continues to have a moderating effect on viticulture in areas of Sonoma and Marin County, including the Dry Creek Valley AVA, the Alexander Valley AVA, the Chalk Hill AVA, the Sonoma Mountain AVA, and the Moon Mountain District Sonoma County AVA, as well as in a number of viticultural areas in counties to the east.

[15] Western Regional Climate Center, Petaluma Fire Stn3, California (046826)

[16] Fog pattern studies have been varied and sometimes relayed in non-published communications, and/or have been prepared in reports considered proprietary. Because of the varied nature of the works, they are not referenced here. Some of these works are referenced elsewhere in this petition and in Exhibit A.

4.5.3 Wind Patterns and Speed

The Petaluma Gap region has long been known for its strong and consistent afternoon winds. The BAAQMD website contains the following description of wind patterns in the Petaluma Gap:[17]

> "The region from the Estero Lowlands to the San Pablo Bay is known as the Petaluma Gap. This low-terrain area is a major transport corridor allowing marine air to pass into the Bay Area. . . Wind patterns in the Petaluma and Cotati Valleys are strongly influenced by the Petaluma Gap. The predominant wind pattern in this region is for marine air to move eastward through the Petaluma Gap, then to split into northward and southward paths as it moves into the Cotati and Petaluma valleys. . . Winds are usually stronger in the Petaluma Valley than the Cotati Valley because it is part of the Petaluma Gap. The low terrain in the Petaluma Gap does not offer much resistance to the marine air as it flows to the San Pablo Bay."

This advection of marine air into Sonoma and Marin Counties helps define viticultural areas known to have cooler or moderately cooler climates. Since most of that marine air is moving inland through the Petaluma Gap, then the Petaluma Gap has to be experiencing these moderating effects first and on a more regular basis. As marine air intrusions fluctuate in extent and intensity throughout the region, the Petaluma Gap, as the corridor by which this marine influence moves inland, is not as prone to fluctuations in the extent of marine advection. Further, the nature of these wind patterns and related fog, which increases in the mid- to late-afternoon, means the moderating effect of coastal air is greatest during the time of day when temperatures would normally be at their highest. These climatic influences ultimately affect the conditions under which grapes are grown, hence affecting the characteristics of grapes produced in the area.

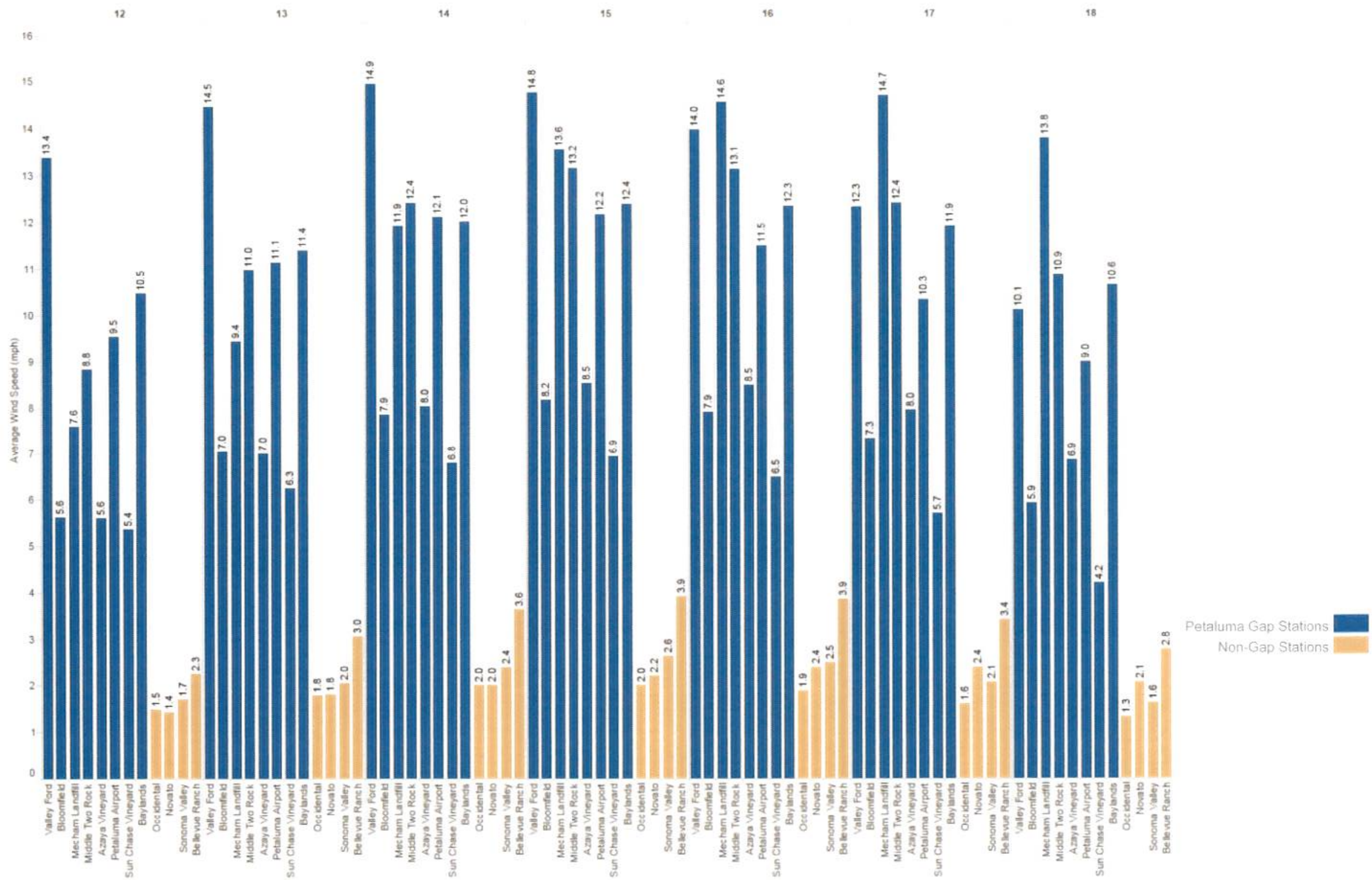
Certainly, areas outside the Petaluma Gap experience high afternoon wind speeds induced by the same pressure gradients. But the afternoon wind speeds within the Petaluma Gap are unique in their consistency and intensity owing to the low terrain. To illustrate this unique characteristic, wind speed data from several weather stations within the Petaluma Gap have been analyzed and compared with wind speed data from weather stations adjacent to but outside the Petaluma Gap. This analysis was focused on the wine grape growing season (April 1 through October 31) and for the afternoon hours 1200 (noon) through 1800 PST.

Table 2 presents an hour-by-hour comparison of average wind speeds and shows a remarkable distinction between afternoon wind speeds within the Petaluma Gap compared to stations just outside the proposed AVA boundaries (see **Section 5.1.2**, Distinguishing Wind Speed Characteristics of the Petaluma Gap, for a map of station locations and additional wind speed analyses).

[17] http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Bay-Area-Climatology/Subregions/Cotati-and-Petaluma-Valleys.aspx

WIND TO WINE

Table 2. Average Afternoon Wind Speed by Hour for Petaluma Gap and Adjacent Non-Gap Stations (April 1 through October 31)



4.5.4 Temperature

Most of the Sonoma County section of the Petaluma Gap falls within an area previously identified by Robert Sisson, former UC Extension farm advisor, as "Marine." This work was portrayed graphically by Paul Vossen,[18] demonstrating the Petaluma Gap area clearly within the "Marine" climate type. The intent of Sission's work was to direct growers to plant grapes favorable to cool-climate environments in the "Coastal Cool" climate type, grapes favorable to warmer climates in the "Coastal Warm" climate types, and to avoid planting grapes within the "Marine" climate type. These classifications were based loosely on a method for establishing degree day totals based on hours of temperatures between 70°F and 90°F. Following is the description provided with Paul Vossens' map, which also demonstrates that the Petaluma Gap was a large part of this climate zone:

> MARINE: The marine zone is under direct ocean influence, lying west of the first mountain ridges of the coast below 1,000 ft. and extending inland through river canyons and the Petaluma gap to Sonoma Mountain. Degree Days per year average 2,185, but range from less than 1,800 to 2,800 depending on the year. This zone also has less than 800 hours between 70 and 90ºF during the growing season (April 1 to Oct. 31). It is the coolest of the three local climatic zones.

Sisson's understanding was that heat accumulations in the marine climate type would be insufficient to allow for proper maturation in grapes.[19] While Sisson's classification was well conceived for its time (approximately in the 1950s to 1980s), the model is in need of an update as successful viticulture exists in many of the areas originally classified as "Marine." What is perhaps more important in defining the Petaluma Gap is the role fog played in Mr. Sission's original classification. The "Marine" climate was based more on Sisson's observed areas of "heaviest" fog intrusion.[20] Hence, the role of fog on temperature in the Petaluma Gap as it relates to viticulture has long been understood, even if speculations as to viticultural viability were inaccurate.

Table 3 presents degree day data for several stations within and adjacent to the Petaluma Gap. Not surprisingly, degree day totals within the Petaluma Gap are lower near the coast (Valley Ford station) and moderate gradually as one moves further east. These data illustrate that Petaluma Gap temperatures are consistent with many other areas of coastal Sonoma and Marin counties, environments suited to grapes that are faster to mature, and hence better suited for cooler climates. In comparison, the Sonoma Valley station (located outside the Petaluma Gap) shows distinctly higher degree day summations. The Bellevue Ranch station (located in southern Santa Rosa) also exhibits higher degree day totals than are typical in the Petaluma Gap. The one anomaly appears to be Sun Chase Vineyards in 2012 with a degree day total of 3110°F. A possible explanation may be the higher elevation at this vineyard. If the inversion layer was on average lower in the 2012 growing season, then Sun Chase Vineyards may have had uncharacteristic temperature patterns. Whatever the reason, Sun Chase Vineyards displayed weather conditions in both 2013 and 2011 consistent with the cool climates characteristic of the marine-influenced locations within Sonoma and Marin counties.

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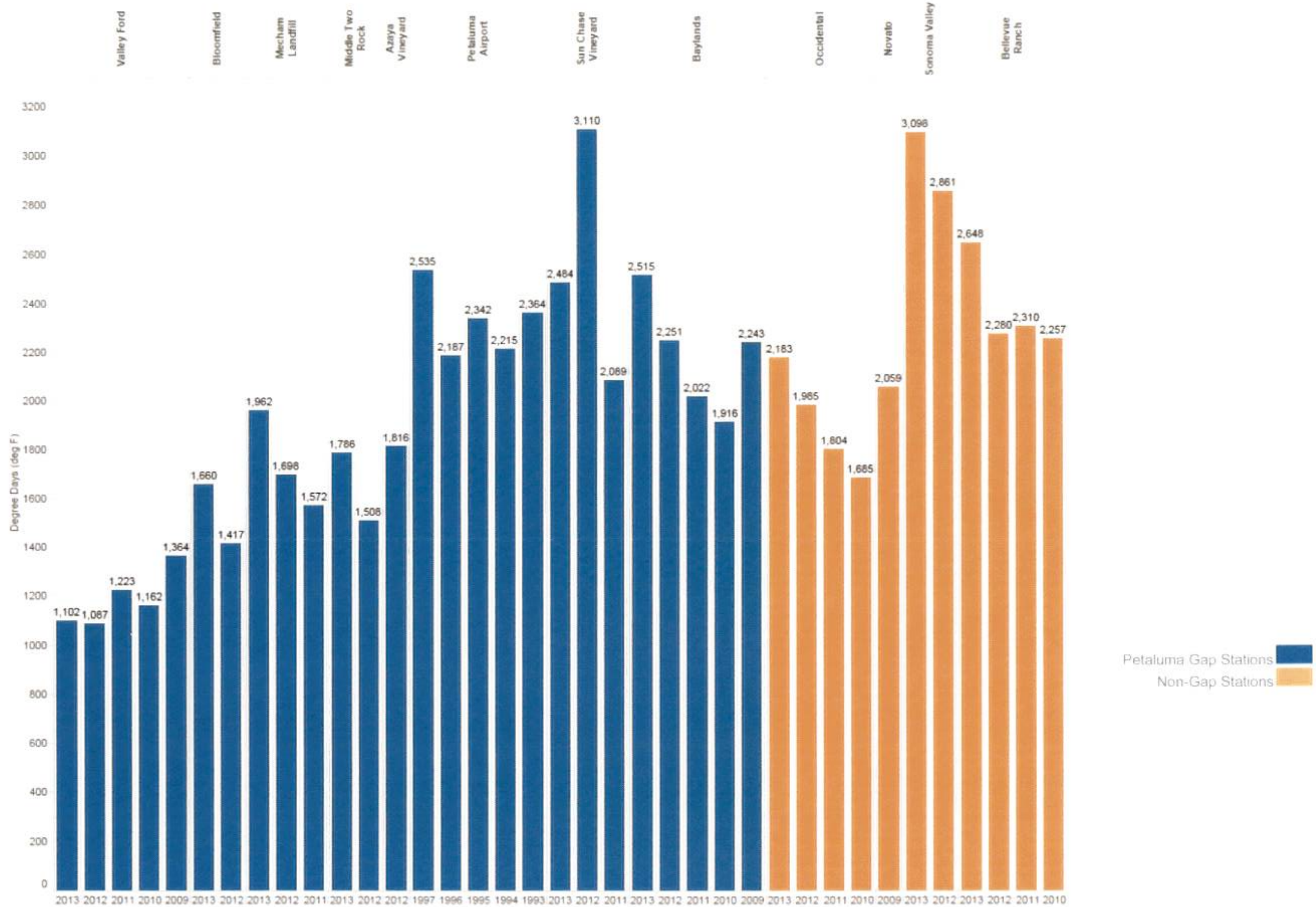
[18] Vossen, Paul, *Sonoma County Climatic Zones*, University of California Cooperative Extension Service, Sonoma County, 1986.

[19] Shabram, Patrick L., "Redefining Appellation Boundaries in the Russian River Valley, California," M.A. thesis, San Jose State University, 1998.

[20] Lawson, Carol Ann, "Guidelines for Assessing the Viticultural Potential of Sonoma County: An Analysis of the Physical Environment," M.A. Thesis, University of California, Davis, 1976.

Table 3. Degree Day Summations by Year for Petaluma Gap and Adjacent Non-Gap Stations (April 1 through October 31)



SECTION 5.0
DISTINGUISHING FEATURES

5.1 Wind Speed

5.1.1 Effect of Wind Speed on Grapevines

Like most plants, grapevines put down roots into the soil to draw water and nutrients up into the stems and leaves. Some of this water is returned to the air by transpiration, the process by which moisture is carried through plants from roots to small pores – called stomata -- on the underside of leaves, where it changes to vapor and is released to the atmosphere. Plants regulate the rate of transpiration by the degree of stomatal opening. The rate of transpiration is also influenced by the evaporative demand of the atmosphere surrounding the leaf such as humidity, temperature, wind and incident sunlight. In conditions of high evaporative demand (e.g., high temperatures or high wind speeds), absorption of water by the roots fails to keep up with the rate of transpiration and the stomata will close. Because stomata also provide the passage of CO_2 and O_2 for plant photosynthesis, stomatal closure to reduce transpiration also will reduce the rate of photosynthesis. In grapevines, photosynthesis is the primary mechanism for producing sugar in the berries.

A study conducted by Texas Tech University and the Texas AgriLife Research and Extension Center[21] demonstrated that leaf level wind speed in excess of 8 miles per hour (mph) had a significant effect on stomatal conductance, which in turn caused a decrease in photosynthetic rate. A similar wind speed effect was reported by Retallack Viticulture,[22] who reported that wind speeds of 11 to 14 kilometers per hour (6.8 to 8.7 mph) "are sufficient to cause the closure of stomates (reducing photosynthesis and transpiration)." The International Wine Review[23] also reported that "[a]bove 7.5 mile per hour, the wind shuts down the stomata of the leaves." Wine Business Monthly reports that sustained winds as low as 8 mph "induces stomatal closure in grapevine leaves."[24]

As described above, the physiological effect of sustained wind speeds above 8 mph on grapevine physiology has been well established. The viticultural consequences of this effect have also been established – to some degree in the literature but more so generally among winemakers. Generally, infrequent periods of wind speeds in excess of 8 mph during the winegrape growing season (April 1 through October 31) are unlikely to result in meaningful effects to the grapevines and the season's crop. However, regular periods of such winds will result in effects that manifest in the grape crop. The

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[21] *Influence of Wind Speed on Gas Exchange of Field-grown 'Cabernet Sauvignon' Grapevines on the Texas High Plains*. Proceedings of the Texas Viticulture & Enology Research Symposium. June 2-3, 2009. Available at https://winegrapes.tamu.edu/research/symposium/Effect%20of%20Wind%20on%20Vine%20Physiology.pdf
[22] *Grapevine Biology*. Retallack Viticulture, September 2012. Available at http://www.viti.com.au/pdf/MVWGG%20Fact%20Sheet%20-%20Grapevine%20Biology.pdf
[23] The International Wine Review. Report #29. October 2011, p. 8. Available at http://www.i-winereview.com/wine-reports.php
[24] Wine Business Monthly. July 2008, p.3. Available at http://www.winebusiness.com/wbm/index.cfm?go=getArticle&dataId=58458

University of California at Davis, in Viticulture & Enology VEN124 - Introduction to Wine Production, Section 1 - Factors Influencing Wine Quality, says that "[high] wind conditions lead to smaller berries with thicker skins, which may be desirable in some varietals."[25] Reduced photosynthesis means that the grapes will have to remain on the vine longer to reach a given sugar level compared with vines not exposed to regular high wind speeds. This longer "hang time" allows the grapes to reach phenolic ripeness (also referred to as physiological ripeness) at lower sugar levels. This provides winemakers with a window of time within which they can choose to harvest the fruit when it best aligns with their particular winemaking style. Grapes harvested at lower sugar levels (to produce a lower alcohol wine) will still have concentrated flavors and varietal characteristics because of the longer hang time, smaller berries, and thicker skins.

The distinctiveness of wines crafted from Petaluma Gap fruit has been noted by a number of well-known winemakers and wine professionals:

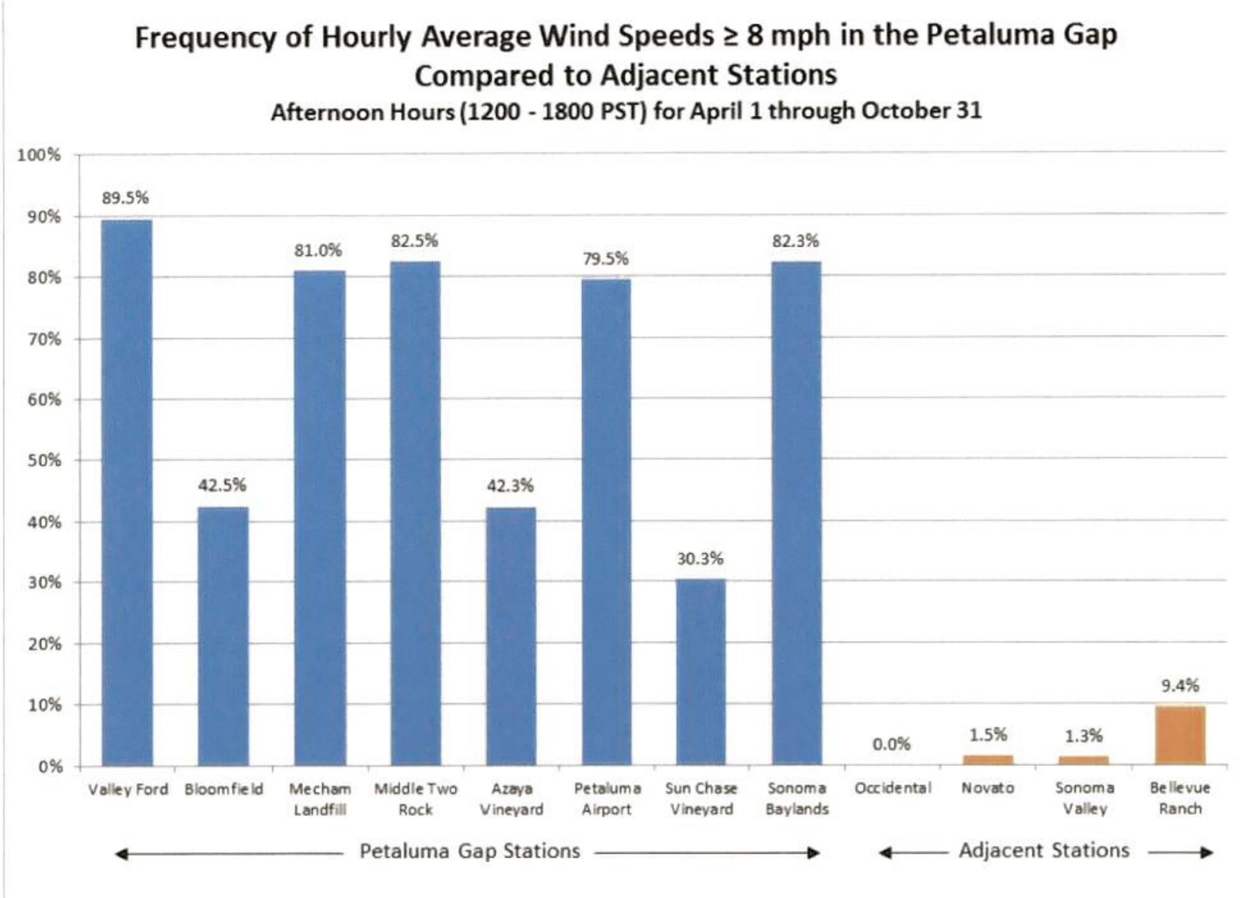
> *"The wines from the Petaluma Gap region are rich, voluptuous and structured with dark black and blue fruit, deep texture and broad structure."* Michael Browne, Winemaker, Kosta-Browne Winery
>
> *"As a winemaker purchasing fruit from the brave wind-buffeted grape-growers of the Petaluma Wind Gap, I have one clear desired outcome, and that is to make great wine. Vineyards in the Gap deliver fresh, precise flavors that create wines with energy, depth and verve."* Pax Mahle, Wine Gap Wines and Pax Wine Cellars
>
> *"With fragrant aromas of ripe berries, lavender, violet, licorice, wild herbs, smoked meats and earth; deep flavors of ripe blackberries, blueberries, boysenberries, red currant, black olives, dark chocolate and fresh cracked pepper; natural vibrant acidity; and restrained levels of alcohol—the fantastic new Syrahs from the Petaluma Gap region are helping to define what the term 'cool-climate' means to consumers looking for food-friendly wines with plenty of structure, power, and finesse."* Christopher Sawyer, Sommelier

5.1.2 Distinguishing Wind Speed Characteristics of the Petaluma Gap

As demonstrated in **Section 4.5.3**, Wind Patterns and Speed, growing season average afternoon wind speeds in the Petaluma Gap are substantially higher than in surrounding areas. A further analysis was conducted to examine the percentage of time that afternoon (1200 to 1800 PST) wind speeds in the Petaluma Gap equal or exceed 8 mph, the threshold at which significant effects on grapevine stomatal conductance and photosynthesis have been demonstrated to occur. **Table 4** presents the results of this analysis and compares the Petaluma Gap data with surrounding stations. These data show that hourly average wind speeds in the Petaluma Gap equal or exceed 8 mph for a substantial portion of the afternoon hours during the growing season, ranging from 30 to nearly 90 percent of the time. In stark contrast, hourly average afternoon wind speeds at adjacent stations located outside the Petaluma Gap rarely equal or exceed 8 mph, ranging from 0 to just under 10 percent of the time.

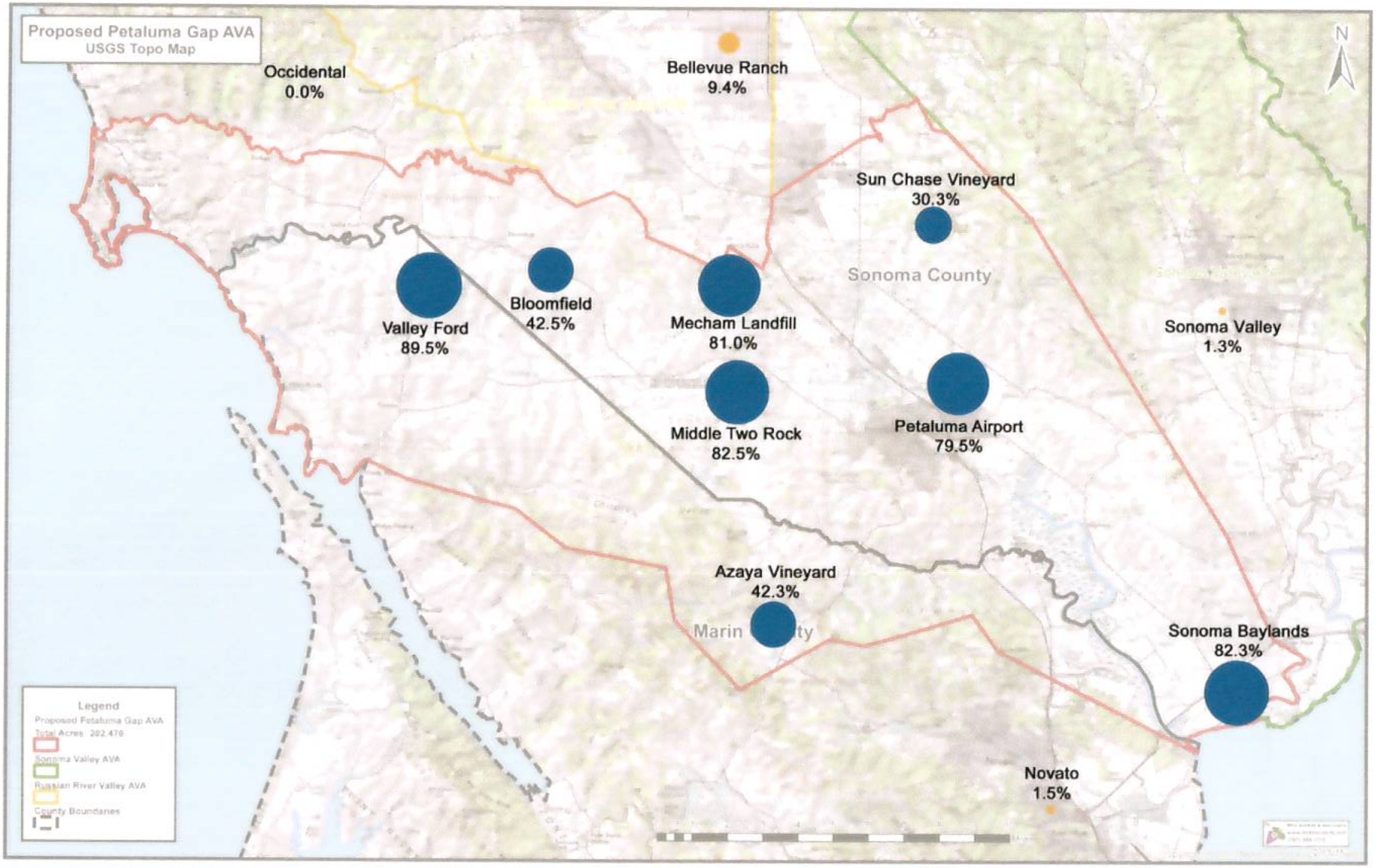
[25] VEN124 – Introduction to Wine Production, Section 1 – Factors Influencing Wine Quality, p. 31. University of California at Davis. Available at http://lfbisson.ucdavis.edu/PDF/VEN124%20Section%201.pdf

Table 4. Frequency of Hourly Average Afternoon Wind Speeds ≥ 8 mph (April 1 through October 31)



These same data are presented graphically in **Map 5**. In this display, the size of the colored dots is proportional to the percentage of time that the afternoon wind speeds are equal to or greater than 8 mph. The map also shows the location of these stations with respect to the proposed Petaluma Gap AVA boundary.

Map 5. Frequency of Hourly Average Afternoon Wind Speeds ≥ 8 mph (April 1 through October 31)



5.2 Other Distinguishing Features

As described in the preceding section, the frequency of afternoon wind speeds greater than or equal to 8 mph, and the effect that wind has on grapevine physiology, is the primary distinguishing characteristic of the Petaluma Gap. However, other features also contribute to its uniqueness. Provided below is a summary of the other geographical features described and documented in the previous sections of this petition, and the degree to which those geographical features contribute to the distinguishing characteristics of the Petaluma Gap.

Geographical Feature	**Distingushing Characteristic**
Topography	While a number of access points exist for marine air flowing inland along the Sonoma and Marin coast, the Petaluma Gap is the largest, most unrestricted of these access points, and viticulture with the Petaluma Gap experiences the full effect of this intruding air. The lack of extensive plains distinguishes the Petaluma Gap from the Santa Rosa Plain to the north and the broader valley of the southern Sonoma Valley AVA and western Los Carneros AVA to the east.
Geology	As a generalization, a safe assessment of the role geology plays in defining the Petaluma Gap AVA is that the Wilson Grove Formation is much more predominant in the Petaluma Gap, and has likely played a major role in the development of the topography.
Soils	The diversity of soil types present indicates that soil does not play a predominant role in defining the proposed AVA.
Watershed and Groundwater	Other than the related topography affecting drainage, watershed has little bearing on viticulture in the area. However, the Wilson Grove Formation Highlands Groundwater Basin helps distinguish the Petaluma Gap from areas to the northwest, south, and east of the proposed AVA.
General Climatology	As marine air intrusions fluctuate in extent and intensity throughout the region, the Petaluma Gap, as the corridor by which this marine influence moves inland, is not as prone to fluctuations in the extent of marine advection.

SECTION 6.0
RELATIONSHIP TO OTHER AVAs

As proposed, the Petaluma Gap AVA will border portions of the Russian River Valley AVA, Bennett Valley AVA, Sonoma Valley AVA, and the Los Carneros AVA. No overlaps with or adjustments to the boundaries of these existing AVAs is proposed.

However, there are two AVAs within which the Petaluma Gap AVA will partially lie -- the Sonoma Coast AVA and the North Coast AVA. In both cases, the Petaluma Gap will include areas both within and outside the existing AVAs. Following is a discussion of each.

6.1 Sonoma Coast AVA

The Sonoma Coast AVA, created in 1987 (TD ATF-253), was based primarily on Robert Sisson's coastal cool classification and the area coming under the greatest coastal influences. While the Treasury decision establishing the Sonoma Coast AVA specifically points to the coastal cool climate as opposed to the coastal warm climate type, the AVA as drawn includes areas defined by Sisson as coastal cool and areas defined as marine climates. Further, the Treasury decision specifically correlates fog intrusion with the Sonoma Coast AVA.[26] This Treasury decision, however, specifically ties the Sonoma Coast AVA to Sonoma County. In no place in TD ATF-253 is Marin County noted, nor is the name "Sonoma Coast" easily identifiable to Marin County.

The Petaluma Gap, as proposed in this petition, includes areas of both Sonoma County and Marin County. Given the reliance on fog intrusion and coastal-influenced climate types, the Sonoma County section of the Petaluma Gap should remain within the Sonoma Coast AVA. The Marin County section, however, lacks appropriate name recognition. Hence, strong justification exists to keep the Sonoma County section of the Petaluma Gap within the Sonoma Coast AVA, while the Marin County section of the Petaluma Gap should remain outside the Sonoma Coast AVA.

6.2 North Coast AVA

The North Coast AVA was established in 1983 (TD ATF-145), based primarily on climate. The Treasury decision specifically addresses maritime influences including coastal fog and, in the case of Lake County, "coastal air." The original petition to establish the North Coast AVA included the counties of Mendocino, Sonoma, and Napa, limiting North Coast to these counties based primarily on name recognition. During the public comment process, arguments were made for the inclusion of portions of Lake County, Solano County, and Marin County. The Marin County addition, however, was limited to the northeastern part of the county. As such, the eastern portion of the Marin section of the Petaluma Gap AVA as proposed in this petition is inside the North Coast AVA, while the western (coastal) part is out.

[26] *Federal Register*, Vol. 52, No. 112, June 11, 1987, page 22303.

The argument for including part of Marin County in the North Coast AVA was based on climatic conditions in line with those found within the rest of the North Coast AVA, along with similar topography. Evidence was provided by Herbert M. Rowland demonstrating these similarities. The TD ATF-145 notes that "most of Marin County has a similar climate to the North Coast."[27] Data were provided, however, that showed significantly cooler climates at Point Reyes than in the rest of Marin County, which provided justification for limiting the Marin addition to the eastern side of the county. It should be noted that Point Reyes is well south of the Petaluma Gap and is a peninsula surrounded by the cold waters of the Pacific Ocean. Further, the Sonoma coastal section of the Petaluma Gap is already in the North Coast AVA.

As noted above, no data were provided with TD ATF-145. Shabram (in Exhibit A) examined weather data from stations in Marshall[28] and Point Reyes Station[29] on Tomales Bay in Marin County but outside the North Coast AVA. Because hourly data were unavailable for these stations, degree day totals based on daily accumulations were calculated for 2013 and compared to recalculated data (using the same methodology) from the Petaluma Gap and within the North Coast AVA. Degree day totals for Marshall were 1784°F, almost identical to 2013 totals at Bloomfield with 1787°F. The Bloomfield station is located within the Petaluma Gap and within the North Coast AVA. The Bloomfield station also is at a site with successful viticulture currently present. Meanwhile, degree day totals at the Point Reyes Station weather station were calculated at 2042°F, which is higher than the Bloomfield location. Hence, the original boundaries for the North Coast, excluding part of Marin County based on the idea that this area is cooler than the North Coast AVA, do not accurately reflect any meaningful climatic differences.

Therefore, an expansion to the North Coast AVA is warranted to include all of the Petaluma Gap. Evidence provided here and in Exhibit A clearly demonstrates the climatic similarities between all of the Petaluma Gap and the North Coast AVA. Further, the documented congruity of the Petaluma Gap clearly establishes the similarities of the proposed expansion area to the North Coast AVA.

[27] *Federal Register*, Vol. 48, No. 184, September 21, 1983, page 42975.

[28] Source: Weather Underground (wunderground.com), KCAMARSH3 (Tomales Bay Oyster Co. Cove), 38.116°N, 122.854°W.

[29] Source: Weather Underground (wunderground.com), KCAPOINT2 (Point Reyes Mesa bluff), 38.080°N, 122.817°W.

SECTION 7.0
BOUNDARY DESCRIPTION AND MAPS

7.1 Proposed Petaluma Gap AVA

The following descriptions identifying the proposed boundaries are based on the Shabram report, which includes consideration of climate analysis, feedback from members of the Petaluma Gap viticulture industry, and Shabram's own analysis and observation while in the field. A simple general rule is that the boundary encompasses the rolling hills below 1000 feet in southwestern Sonoma County and northern Marin County. Along the fringes of the viticultural area, elevations above 1000 feet are present, but the peaks of these constraining topographic features have been used for simplification. So too have the coastline of the Pacific Ocean and San Pablo Bay been utilized for simplification despite being unlikely locations for viticulture (in the case of the Pacific Ocean, temperatures would be too cool and in the case of San Pablo Bay, marshlands would be unlikely to support viticulture).

This boundary follows points found on the following quadrangles of USGS 7.5' Series topographic maps. Copies of these USGS maps with the proposed Petaluma Gap AVA boundaries are included as **Exhibit C** in this petition.

Cotati, California
Glen Ellen, California
Petaluma River, California
Sears Point, California
Petaluma Point, California
Novato, California
Petaluma, California
Point Reyes NE, California
Tomales, California
Bodega Head, California
Valley Ford, California
Two Rock, California

1) The beginning point is on the Cotati map at the intersection of Grange Road (known as Crane Canyon Road to the west) and the boundary of sections 9 and 16, T6N, R7W. From the beginning point, proceed in a straight line 1.0 mile southeast to intersection of the 900 foot elevation line and the boundary of sections 15 and 16, T6N, R7W, approximately 500 feet north of the southwest corner of section 15, then
2) Proceed in a straight line east-southeast 0.5 mile onto the Glen Ellen map to the terminus of an unnamed unimproved road just above 1080 feet in elevation just north of the boundary of sections 15 and 22, T6N, R7W, then
3) Proceed in a straight line southeast 0.6 mile to the intersection of Crane Creek and the 1200 foot elevation line, Section 22, T6N, R7W, then
4) Proceed southeast 2.9 miles to Sonoma Mountain to the horizontal control station 2,271 feet, T6N, R6W, then
5) Proceed in a straight line southeast 10.5 miles onto the Petaluma River map then Sears Point map to the summit of Wildcat Mountain, then
6) Follow a straight line south-southeast 3.3 miles to the intersection of Highway 121 and Highway 37, then

7) Follow Highway 37 east-northeast less than 0.1 mile to its intersection with Tolay Creek, then

8) Follow Tolay Creek in a general southerly direction 3.9 miles onto the Petaluma Point map to San Pablo Bay, then

9) Follow the San Pablo Bay shoreline in a general westerly direction 2.7 miles to Petaluma Point, then

10) Proceed in a straight line northwest 6.3 miles onto the Novato map, then onto the Petaluma River Map to the summit of Burdell Mountain, then

11) Proceed in a straight line northwest 1.3 miles to unnamed summit of 1193 feet, then

12) Proceed in a straight line west-southwest 2.2 miles onto the Petaluma map to an unnamed summit of 1209 feet, then

13) Proceed in a straight line west-southwest 0.8 mile to an unnamed summit of 1296 feet, then

14) Proceed in a straight line west 1.0 mile to the summit of Red Hill, section 31, T4N, R7W, then

15) Proceed in a straight line southwest 2.9 miles to the summit of Hicks Mountain, then

16) Proceed in a straight line west-northwest 2.7 miles onto the Point Reyes NE map to an unnamed summit of 1087 feet, then

17) Proceed in a straight line north-northeast 1.5 miles to an unnamed summit of 1379 feet, then

18) Proceed in a straight line west-northwest 2.9 miles to a spur of 935 feet located on an unnamed mountain exceeding 960 feet, then

19) Proceed in a straight line northwest 1.8 miles to an unnamed summit of 804 feet, then

20) Proceed in a straight line west-northwest 3.1 miles onto the Tomales map to an unnamed summit of 741 feet, then

21) Proceed in a straight line northwest 1.3 miles to BM10 on Highway 1, then

22) Follow the north shoreline of the Walker Creek estuary and then the Pacific coast in a general northwesterly direction 19.5 miles onto the Valley Ford and then Bodega Head maps to the mouth of Salmon Creek, then

23) Follow Salmon Creek 9.6 miles onto the Valley Ford map to the intersection of Salmon Creek and an intermittent stream, Estero Americano land grant, T6N, R10W, then

24) Proceed in a straight line east 1.0 mile to VABM 724 on an unnamed hilltop, Estero American land grant, T6N, R10W, then

25) Proceed in a straight line east-southeast 0.8 mile to BM 61 on an unnamed light duty road along Ebabbias Creek, Cañada de Pogolimi land grant, T6N, R10W, then

26) Proceed in a straight line southeast 0.6 mile to an unnamed summit of 488 feet, Cañada de Pogolimi land grant, T6N, R10W, then

27) Proceed in a straight line 0.1 mile southeast to the terminus of an unnamed unimproved road, Cañada de Pogolimi land grant, T6N, R10W, then

28) Proceed along this unimproved road northeast then south 0.9 mile to its intersection with the 400 foot elevation line, Cañada de Pogolimi land grant, T6N, R10W, then

29) Follow the 400 foot elevation line in an easterly direction 6.7 miles onto the Two Rocks map to its intersection with Burnside Road just north of BM 376, Cañada de Pogolimi land grant, T6N, R10W, then

30) Follow Burnside Road south less than 0.1 mile to the intersection with an unnamed medium duty road at BM 376, then

31) Proceed in a straight line southeast 0.6 mile an unnamed summit of 610 feet, T6N, R9W, then

32) Proceed in a straight line east-southeast 0.8 mile to an unnamed summit of 641 feet, T6N, R9W, then

33) Proceed northeast in a straight line that runs through the intersection of an intermittent stream and Canfield Road 1.2 miles to its intersection with the common boundary between Ranges 8 and 9, then

34) Proceed in a straight line southeast 0.5 mile to an unnamed summit of 524 feet, T6N, R8W, then

35) Proceed in a straight line southeast 0.8 mile to the intersection of an unnamed unimproved road (leading to four barn-like structures) and an unnamed medium duty road (known locally as Roblar Road), T6N, R8W, then

36) Proceed in a straight line south 0.5 mile to an unnamed summit of 678 feet, T6N, R8W, then

37) Proceed in a straight line east-southeast 0.8 mile to an unnamed summit of 599 feet, T5N, R8W, then

38) Proceed in a straight line east-southeast 0.7 mile to an unnamed summit of 604 feet, T5N, R8W, then

39) Proceed in a straight line east-southeast 0.9 mile onto the Cotati map to the intersection of a short unnamed light duty road leading past a group of barn like structures and Meacham Road, T5N, R8W, then

40) Follow Meacham Road north-northeast 0.8 mile to its intersection with Stony Point Road, T5N, R8W, then

41) Follow Stony Point Road southeast 1.1 mile to its intersection with the 200 foot elevation line, T5N, R8W, then

42) Proceed in a straight line north-northeast 0.5 mile to a point were an unnamed intermittent stream intersects U.S. Highway 101, T5N, R8W, then,

43) Follow U.S. Highway 101 in a northerly direction 1.5 miles to its intersection with the Gravenstein Highway (Highway 116), T6N, R8W, then

44) Proceed in a straight line 3.4 miles northeast to the intersection of Crane Creek and Petaluma Hill Road.

45) Follow Crane Creek in a general easterly direction 0.8 mile to the intersection of Crane Creek and the 200 foot elevation line, T6N, R7W, then

46) Follow the 200 foot elevation line in a general northerly direction 1.0 miles to its intersection with an intermittent stream just south of Crane Canyon Road, T6N, R7W, then

47) Follow this intermittent stream east then north along the northern branch of the stream 0.3 mile to its intersection with Crane Canyon Road, T6N, R7W, then

48) Follow Crane Canyon Road in a northeasterly direction 1.2 miles to the beginning point.

7.2 North Coast AVA Expansion

The proposed expansion to the North Coast AVA should use common borders with the Petaluma Gap AVA. This boundary expansion is based on the understanding that the characteristics of the Petaluma Gap AVA warrant its inclusion in the North Coast AVA. As a straight line runs from the northern part of the proposed Petaluma Gap AVA to a point well south of the Petaluma Gap (Barnabe Mountain), a point approximately along that line has been included in both the proposed boundaries for the Petaluma Gap and the revised North Coast AVA boundaries.

In addition to the current USGS 1:250,000 scale maps delineating the North Coast AVA, the following maps are added as part of the proposed expansion. Copies of these USGS maps with the proposed expansion area for the North Coast AVA boundaries are included in **Exhibit C** in this petition.

"Tomales, CA," scale 1:24,000, edition of 1995 and photorevised in 1971.
"Point Reyes NE, CA," scale 1:24,000, edition of 1995 and photorevised in 1971.

From the beginning point on the Santa Rosa, California USGS 1:250,000, at the point where the Sonoma and Marin County boundary joins the Pacific Ocean, points (1) and (2) would be replaced with the following description:

1) Then follow the Pacific coast in a general southeasterly direction 9.4 miles onto the Tomales map to Preston Point;
2) Then east 1.0 mile along the north shoreline of the Walker Creek estuary to BM10 on Highway 1;
3) Then southeast in a straight line 1.3 miles to the an unnamed summit of 741 feet;
4) Then follow a straight line southeast 3.1 miles onto the Point Reyes NE to an unnamed summit of 804 feet;
5) Then southeast in a straight line 1.8 miles to an unnamed mountain spur of 935 feet;
6) Then southeast in a straight line 12.7 miles to the peak of Barnabe Mountain (elevation 1466 ft);

Following is the complete North Coast AVA boundary description including the proposed expansion:

The beginning point is found on the "Santa Rosa, California" U.S.G.S. map at the point where the Sonoma and Marin County boundary joins the Pacific Ocean.

1) Then follow the Pacific coast in a general southeasterly direction 9.4 miles onto the Tomales map to Preston Point;
2) Then northeast 1.0 mile along the north shoreline of the Walker Creek estuary to BM10 on Highway 1;
3) Then southeast in a straight line 1.3 miles to the an unnamed summit of 741 feet;
4) Then follow a straight line southeast 3.1 miles onto the Point Reyes NE to an unnamed summit of 804 feet;

5) Then southeast in a straight line 1.8 miles to an unnamed mountain spur of 935 feet;
6) Then southeast in a straight line for approximately 12.7 miles to the peak of Barnabe Mountain (elevation 1466 feet);
7) Then southeast in a straight line for approximately 10.0 miles to the peak of Mount Tamalpais (western peak, elevation 2604 feet);
8) Then northeast in a straight line for approximately 5.8 miles to the confluence of San Rafael Creek and San Rafael Bay in San Rafael;
9) Then north and northeast following San Rafael Bay and San Pablo Bay to Sonoma Creek;
10) Then north following Sonoma Creek to the boundary between Napa and Solano Counties;
11) Then east and north following the boundary between Napa and Solano Counties to the right-of-way of the Southern Pacific Railroad in Jameson Canyon;
12) Then east following the right-of-way of the Southern Pacific Railroad to the junction with the Southern Pacific in Suisun City;
13) Then north in a straight line for approximately 5.5 miles to the extreme southeastern corner of Napa County;
14) Then north following the boundary between Napa and Solano Counties to the Monticello Dam at the eastern end of Lake Berryessa;
15) Then following the south and west shore of Lake Berryessa to Putah Creek;
16) Then northwest following Putah Creek to the boundary between Napa and Lake Counties;
17) Then northwest in a straight line for approximately 11.4 miles to the peak of Brushy Sky High Mountain (elevation 3196 feet);
18) Then northwest in a straight line for approximately 5.0 miles to Bally Peak (elevation 2288 feet);
19) Then northwest in a straight line for approximately 6.6 miles to the peak of Round Mountain;
20) Then northwest in a straight line for approximately 5.5 miles to Evans Peak;
21) Then northwest in a straight line for approximately 5.0 miles to Pinnacle Rock Lookout;
22) Then northwest in a straight line for approximately 8.0 miles to Youngs Peak (elevation 3683 feet);
23) Then northwest in a straight line for approximately 11.2 miles to the peak of Pine Mountain (elevation 4057 feet);
24) Then northwest in a straight line for approximately 12.1 miles to the peak of Sanhedrin Mountain (elevation 6175 feet);
25) Then northwest in a straight line for approximately 9.4 miles to the peak of Brushy Mountain (elevation 4864 feet);
26) Then southwest in a straight line for approximately 17.6 miles to the confluence of Redwood Creek and the Noyo River;
27) Then west following the Noyo River to its mouth at the Pacific Ocean;
28) Then southeast following the Pacific Ocean shoreline to the point of beginning.

Appendix to Petition

Petaluma Gap AVA Petition
Periods of Record for Weather Stations

Station Name	Period of Record
Valley Ford	2009 – 2013 (5 years)
Bloomfield	2010 – 2013 (4 years)
Mecham Landfill	2011 – 2013 (4 years)
Middle Two Rock	2011 – 2013 (3 years)
Azaya Vineyard	2012 – 2013 (2 years)
Petaluma Airport	1993 – 1997 (5 years)
Sun Chase Vineyard	2011 – 2013 (3 years)
Sonoma Baylands	2009 – 2013 (5 years)
Occidental	2009 – 2013 (5 years)
Novato	2009 – 2010 (2 years)
Sonoma Valley	2012 – 2013 (2 years)
Bellevue Ranch	2012 – 2013 (2 years)

Note: This appendix shows the period of record for the weather stations mentioned in Table 4 and Map 5 of the petition. This information was provided by the petitioner at the request of TTB after the petition was submitted.

TTB Note: The information in this table has been updated to include data from 2014. The updated table can be seen in Addendum 2 to the petition.

February 20, 2015

PETITION TO ESTABLISH THE PETALUMA GAP AVA

ADDENDUM 1

Purpose

This **Addendum 1** to the Petaluma Gap AVA Petition has been prepared in response to the TTB's request to supplement the wind speed analysis with data from the 2014 growing season (April 1 through October 31). Although the initial petition was submitted in February 2015, the wind speed data gathering and analysis was completed in late summer 2014. At that time, wind speed data for the 2014 growing season were not complete.

Discussion

To help define and support the distinguishing characteristics of the Petaluma Gap AVA, the initial petition included an analysis of wind speed from eight meteorological stations located within the proposed AVA boundary and four meteorological stations located adjacent to but outside the proposed AVA boundary. In response to the TTB's request to include 2014 data, the Petaluma Gap Winegrowers Alliance (PGWA) sought to acquire wind speed data for the 2014 growing season. Consequently, the PGWA was able to acquire 2014 wind speed data for all but two of the twelve stations used for the original analysis. These 2014 data were then compiled together with the previous data to produce an updated wind speed analysis to support the Petaluma Gap AVA petition. The table below lists the twelve station names along with the corresponding data periods of record used for the updated analysis.

Station Name	Period of Record
Valley Ford	2009 – 2014 (6 years)
Bloomfield	2011 – 2014 (4 years)
Mecham Landfill	2011 – 2014 (4 years)
Middle Two Rock	2011 – 2014 (4 years)
Azaya Vineyard	2012 – 2014 (3 years)
Petaluma Airport	1993 – 1997 (5 years) [1]
Sun Chase Vineyard	2011 – 2013 (3 years) [2]
Sonoma Baylands	2009 – 2014 (6 years)
Occidental	2009 – 2014 (6 years)
Novato	2009, 2012 – 2014 (4 years) [3]
Sonoma Valley	2012 – 2014 (3 years)
Bellevue Ranch	2010 – 2014 (5 years)

[1] The Petaluma Airport station stopped collecting hourly data in 1997.

[2] The station at the Sun Chase Vineyard experienced a mechanical failure in February 2014 and was not repaired until after the growing season was over.

[3] The 2010 and 2011 data for the Novato station were largely incomplete and so were not included in this analysis.

The following pages present the results of the updated wind speed analysis with inclusion of the 2014 growing season. For ease of comparison, the table and figure numbers from the initial petition are used here with the addition of “a” after the number.

Table 2a provides an updated hour-by-hour comparison of average afternoon wind speeds within the Petaluma Gap compared to stations just outside the proposed AVA boundaries. The same notable distinction between Gap and non-Gap stations reported in the initial petition is clearly evident in the updated analysis as well.

Table 4a presents the updated percentage of time that afternoon wind speeds equal or exceed 8 miles per hour (mph), the threshold at which significant effects on grapevine stomatal conductance and photosynthesis have been demonstrated to occur (see Section 5.1.1 of the original petition). Once again, the dramatic difference between Gap and non-Gap stations is clearly evident.

Map 5a is an updated graphical display of the data from Table 4a. The size of the colored dots is proportional to the percentage of time that the afternoon wind speeds are equal to or greater than 8 mph (i.e., the larger the dot the greater the percentage of winds equal to or greater than 8 mph). The map also shows the location of the Gap and non-Gap stations with respect to the proposed Petaluma Gap AVA boundaries.

Summary

In summary, the updated wind speed analysis with inclusion of the 2014 growing season data continues to define and support the distinguishing characteristics of the Petaluma Gap AVA as presented in the initial petition.

FROM WIND TO WINE

Table 2a. Average Afternoon Wind Speed by Hour for Petaluma Gap and Adjacent Non-Gap Stations (April 1 through October 31)

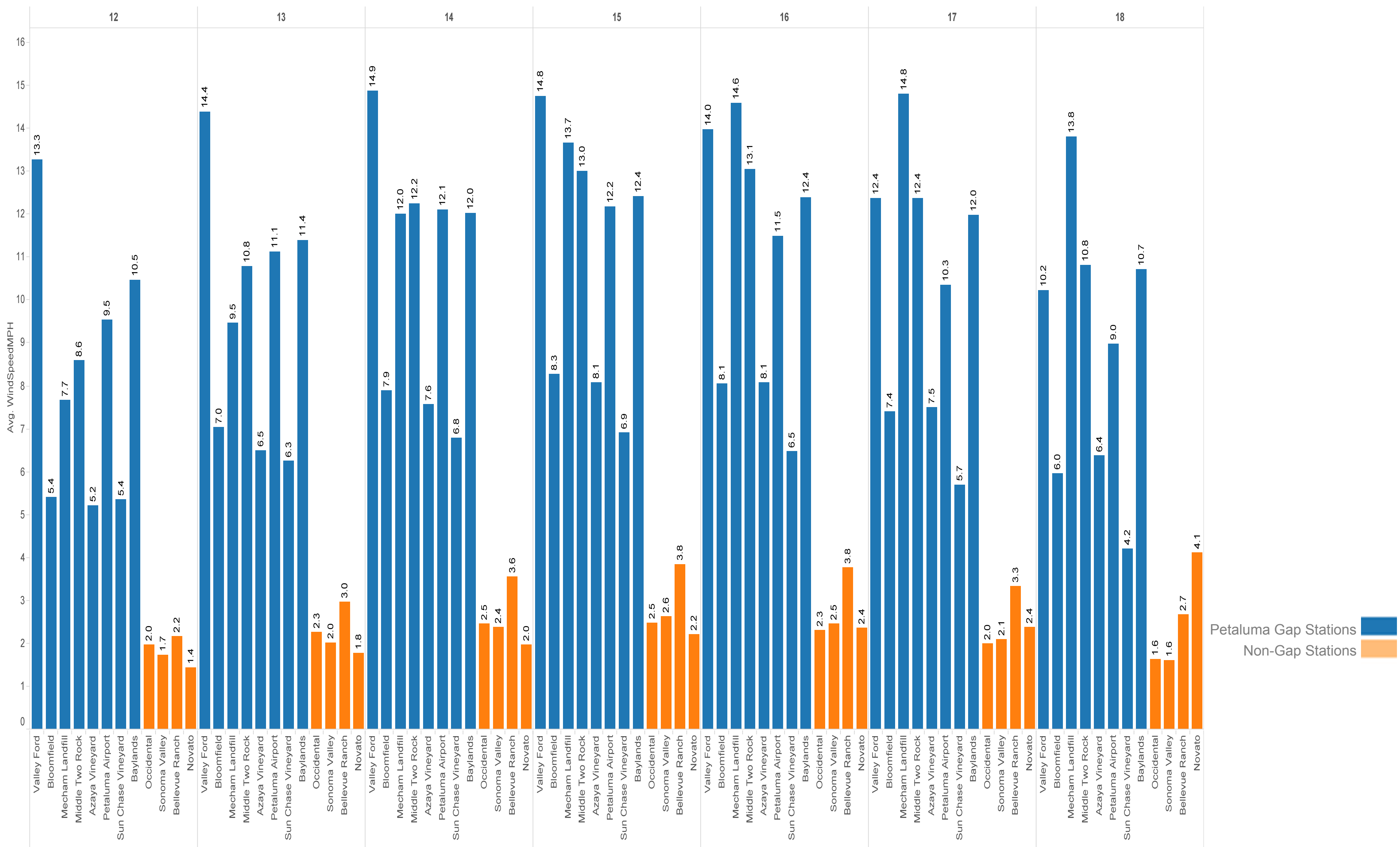
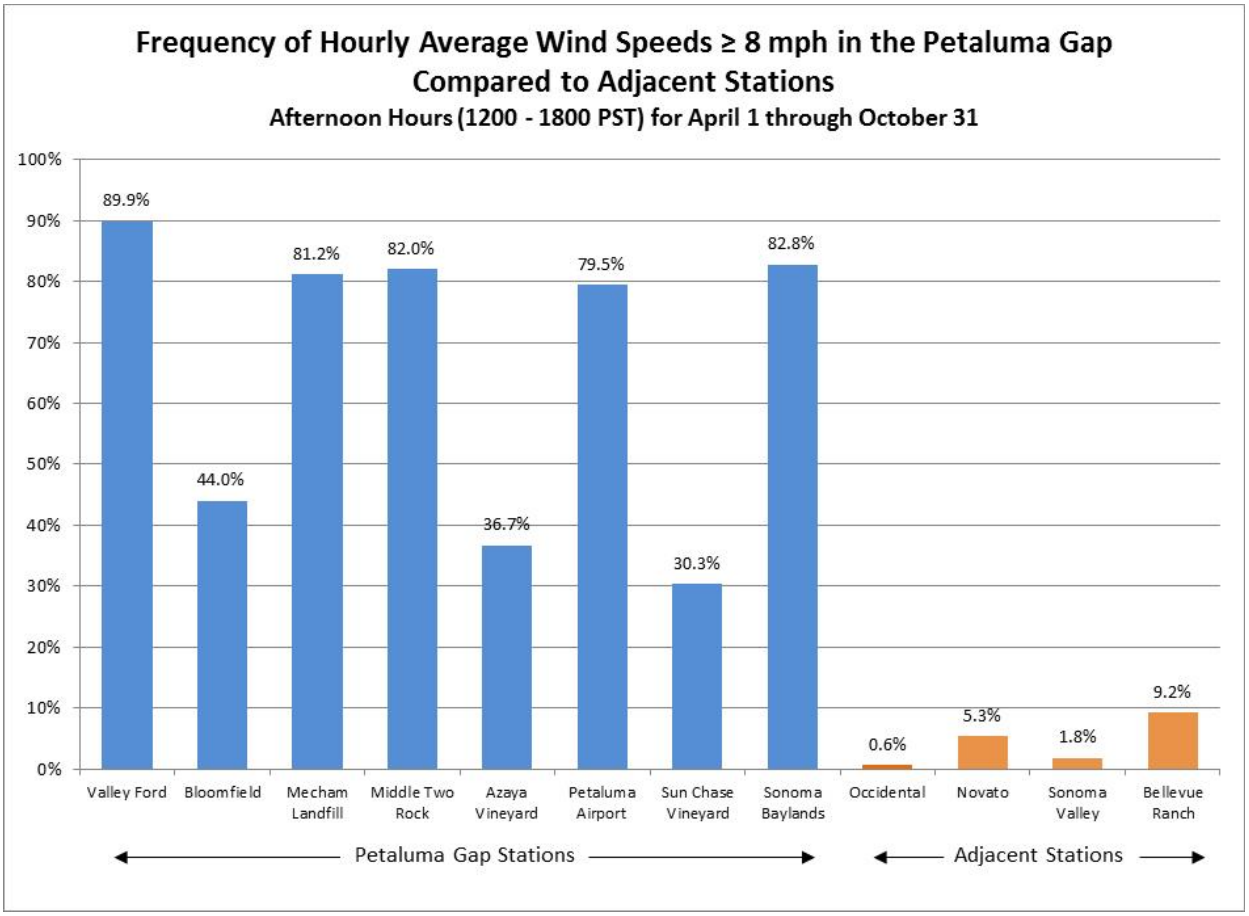
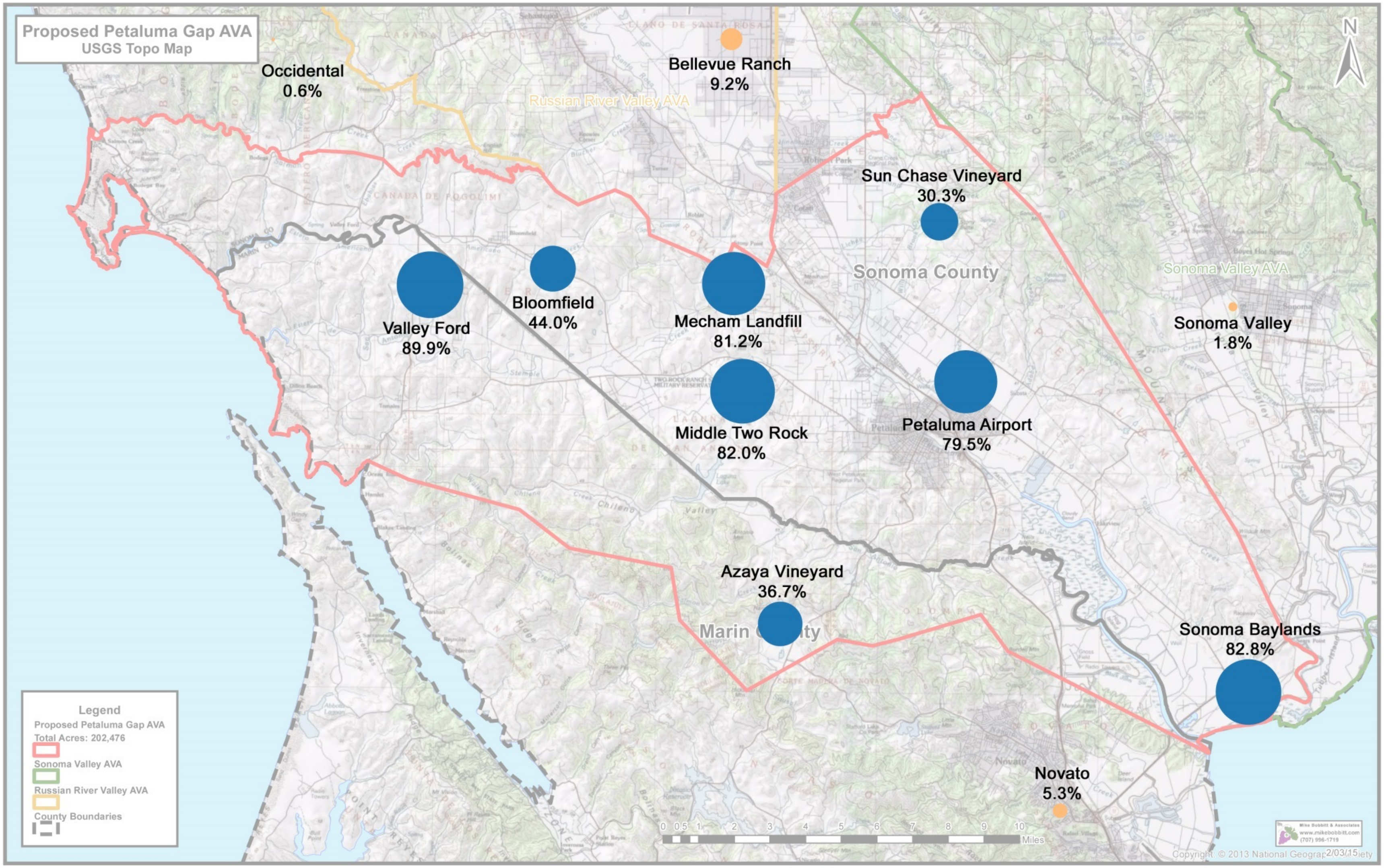


Table 4a. Frequency of Hourly Average Afternoon Wind Speeds ≥ 8 mph (April 1 through October 31)



Map 5a. Frequency of Hourly Average Afternoon Wind Speeds ≥ 8 mph (April 1 through October 31)



FROM WIND TO WINE

EXHIBIT A

Unique Geographic Characteristics of the Petaluma Gap

Prepared by Patrick L. Shabram
for the Petaluma Gap Winegrowers Alliance
February 2015

Unique Geographic Characteristics of the Petaluma Gap

by Patrick L Shabram

Summary

The Petaluma Gap is a wine growing geographic region of southern Sonoma County and northern Marin County known for consistent wind patterns of Pacific air moving through the Petaluma wind gap. The region also should be recognized for its related topography of rolling hills, many of which are windswept. This cool-climate grape growing region is distinguished from other areas of the Sonoma Coast AVA and other surrounding cool-climate grape growing regions by both its topography and related climate.

Overview

The Petaluma Gap has long been recognized as a viticultural region of Sonoma and Marin Counties, but, as of yet, has not petitioned for recognition by the Alcohol and Tobacco Tax and Trade Bureau (TTB) as an American Viticultural Area (AVA). The name is already commonly used by media outlets and wine writers as well as the local wine industry. In anticipation of petitioning the TTB for official recognition as a viticultural area, the Petaluma Gap Winegrowers Alliance has asked me to prepare this report of the characteristics (from a viticultural perspective) that make this area unique.

Located in southern Sonoma County and northern Marin County, California, the Petaluma Gap is best known for its wind, which allows for direct access to coastal marine air and fog. The area's topography, with rolling hills below 1000 feet in elevation, offers this access.

This report outlines a geographical review of the Petaluma Gap and compares and contrasts it with other viticultural areas within Sonoma County. As part of the Petaluma Gap is within the Sonoma Coast AVA, comparisons and distinctions will also be made in relationship to other areas within the Sonoma Coast AVA as well as Marin County to the south. Further, overlaps outside the Sonoma Coast AVA and North Coast AVA are addressed. Finally, recommended boundaries are proposed to best apply the viticultural area to the characteristics that best define it.

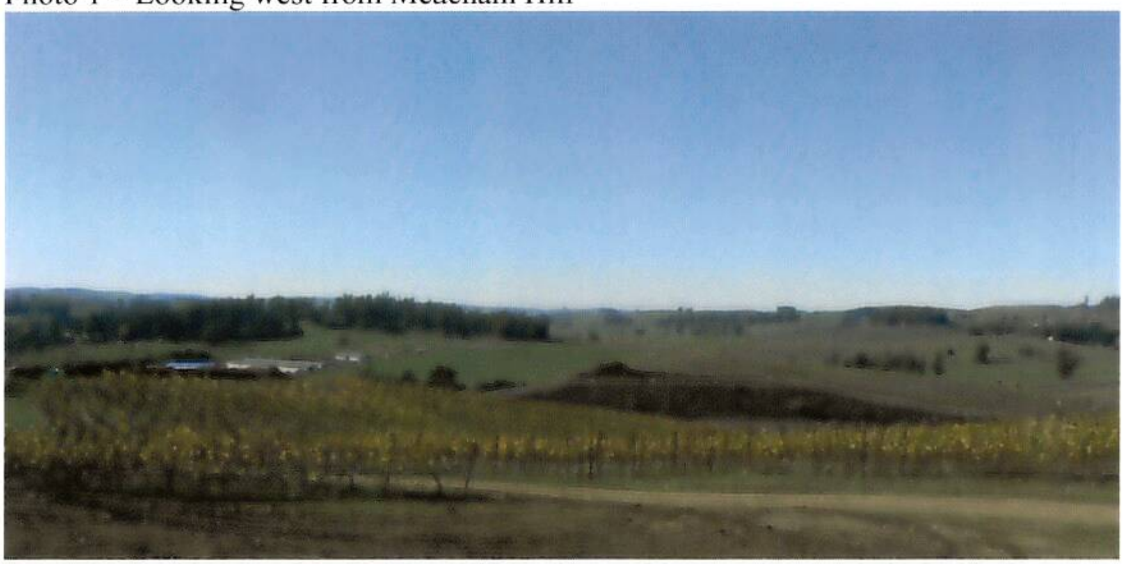
Geographical Characteristics

Topography – The Petaluma Gap is most noted for consistent winds blowing in from the Pacific Ocean through the Petaluma wind gap, but perhaps topography (a key component to these winds) offers the greatest distinction of this area from surrounding areas. From approximately Salmon Creek north of Bodega Bay to Walker Creek at Tomales Bay to the south, the coastal highlands that are characteristic along the California coast are not nearly as pronounced. Many Sonoma County coastal mountains north of this area experience elevations above 800 feet, with elevations above 1000 feet being common.[1] Even higher ridgelines are found in Marin County to the south. Meanwhile, within this approximate 18 mile (30 km) stretch of coastline (direct aerial distance of 12.5 miles or 20 km), no topographic barrier along the coast is higher than 600 feet in elevation. The

[1] Because U.S.G.S. 1:24,000 scale maps will be utilized for the boundary descriptions at the conclusion of this report, all elevation units utilize the English system of measurements.

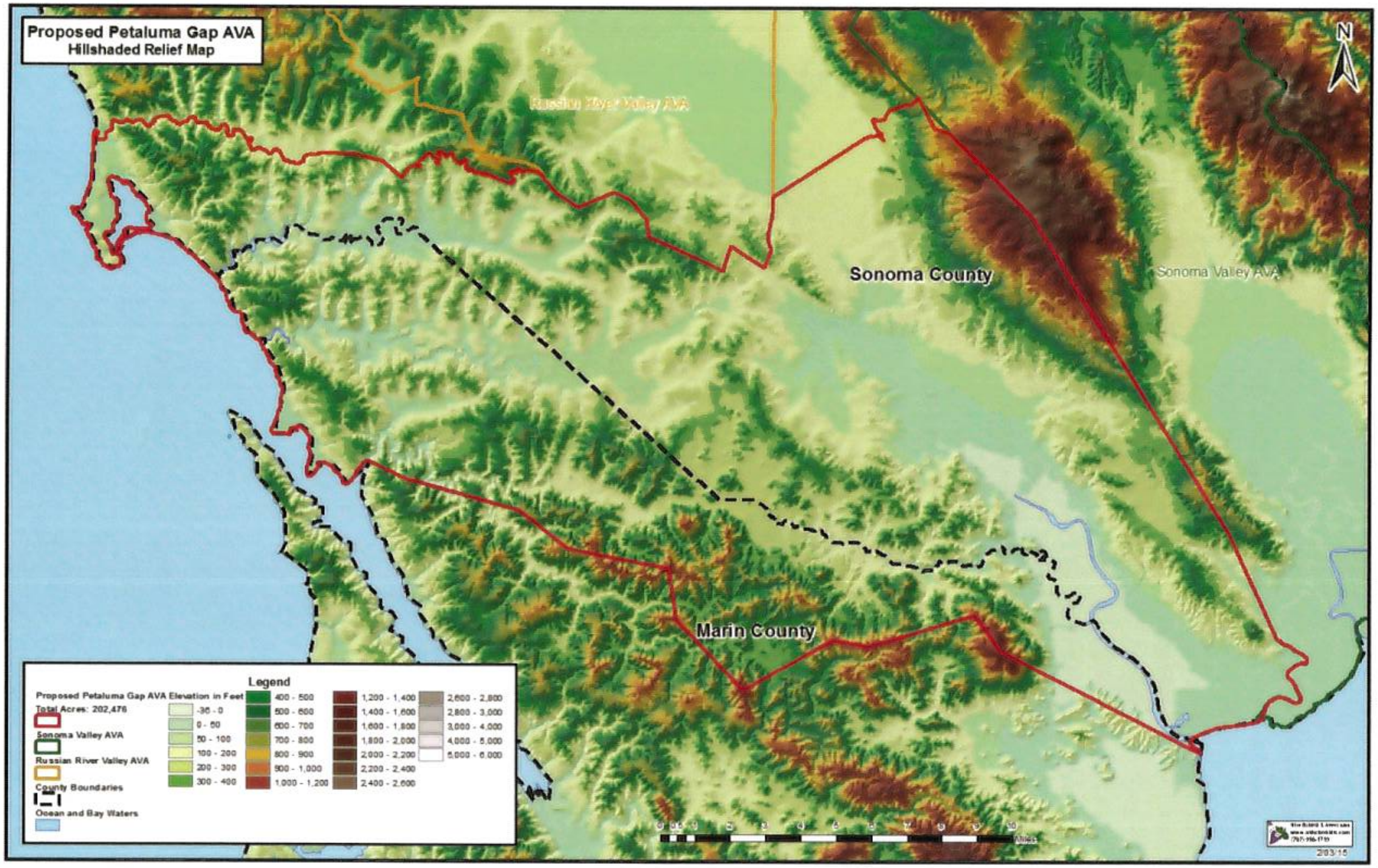
area is not flat, with many rolling hills, some of which are steep in places, but the topography is generally lower. This rolling terrain runs in an east-west orientation, eventually shifting to a more northwest-southeast orientation along either side of U.S. Highway 101. The net result is a corridor for coastal winds moving inland. This path is blocked by Sonoma Mountain to the east of Petaluma. To the southeast, approximately 33 miles (53km) from the Pacific Coast at the Marin/Sonoma county line, the corridor of lower elevations allows a path directly to San Pablo Bay. To the north of Petaluma, the wind gap branches to the north into the Cotati Valley and onto the Santa Rosa Plain (also known on U.S.G.S. topographic maps as the Llano de Santa Rosa). North along the coast, the highlands west of Occidental reach elevations above 1000 feet. Further to the east, the Santa Rosa Plain is marked by significantly flatter terrain than the rolling hills of the Petaluma Gap. To the east of the Petaluma Gap, Sonoma Mountain reaches an elevation of 2295 feet. To the south of Petaluma Gap, various ridgelines reach over 1000 feet in elevation, starting with the Bolinas Ridge in the west to Burdell Mountain (1,558 feet) closer to San Pablo Bay.

Photo 1 – Looking west from Meacham Hill

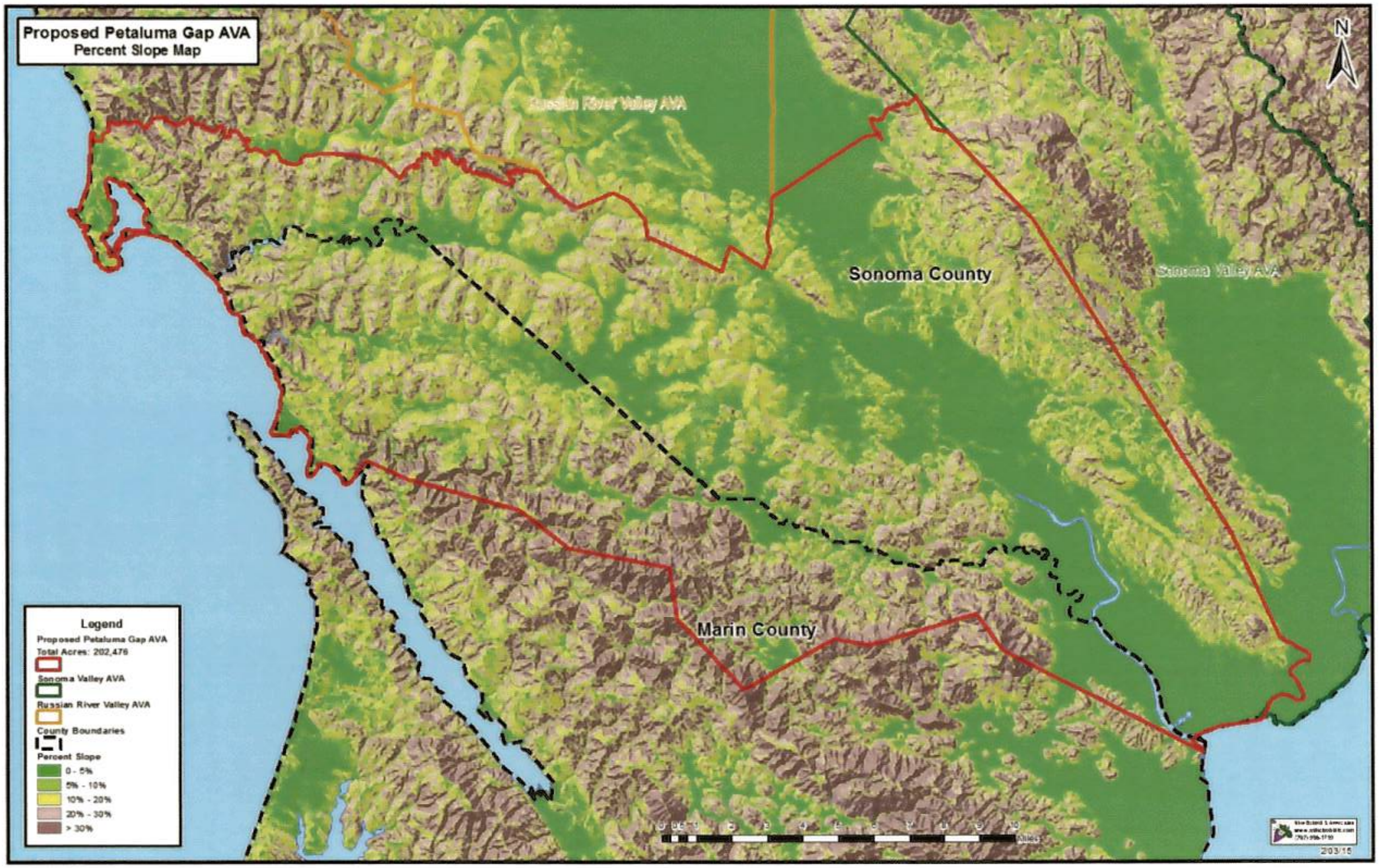


In this view, looking west from Meacham Hill (northwest of the summit) towards the Pacific Ocean, rolling hills dominate the landscape.

Map 1 – Terrain Map of Petaluma Gap (shaded relief)



Map 2 – Slope Map of Petaluma Gap (percent slope)



As noted later, this topography allows coastal influences to infiltrate the Petaluma Gap relatively unhindered. Marine airflow also is important to the Russian River Valley AVA and the Green Valley of the Russian, but this flow filters in through the Russian River Valley to the north and from air diverted north from the Petaluma Gap onto the Santa Rosa Plain. The Sonoma Valley, with temperatures moderated by marine airflow, experiences airflow from the Petaluma Gap via the Santa Rosa Plain to the north and from San Pablo Bay to the south. The Bennett Valley AVA experiences some marine cooling, but this air spills over several passes from the Santa Rosa Plain into the Bennett Valley. Hence, marine airflow filters in to other local viticultural areas through restricted access points, even in the Russian River Valley which is greatly influenced by this marine air. While a number of access points exist for marine air flowing inland along the Sonoma and Marin coast, the Petaluma Gap is the largest, most unrestricted of these access points, and viticulture with the Petaluma Gap experiences the full effect of this intruding air.

Photo 2 – Sonoma Mountain from near Hammock Hill

Looking east from near Hammock Hill, Sonoma Mountain can be seen in the distance. Taken at 726 feet, this photo is from one of the highest points within the Petaluma Gap (excluding the confining ridgelines).

While the terrain of the Petaluma Gap is better defined as rolling hills than mountainous, flatland is limited. The most flatland is found along the Petaluma River, especially in the eastern area of the City of Petaluma and the wetlands to the southeast as the river approaches its mouth at San Pablo Bay. Most other areas of flat terrain within the

Petaluma Gap are limited to small valleys and fluvial terraces. This lack of extensive plains distinguishes the Petaluma Gap from the Santa Rosa Plain to the north and the broader valley of the southern Sonoma Valley AVA and western Los Carneros AVA to the east.

Photo 3 – Sonoma Valley east of the Sonoma Mountains and south of Sonoma

This photo was taken from Boneau Road (west side of Sonoma Valley AVA and Los Carneros AVA), looking northeast across the southern Sonoma Valley towards the southern flank of Arrowhead Mountain. Such an open plain is not common to the Petaluma Gap.

Geology – The topography of the Petaluma Gap is in many ways the result of underlying geology, along with drainage patterns, climatic variations, and biological influences. The Petaluma Gap area comprises a variety of geologic formations, a result of tectonic subduction and later faulting, causing accretion of different geological materials. Most common in the western part of the viticultural area is the Wilson Grove Formation (formerly known as the Sebastopol Merced Formation[2]) of claystone, siltstone and fine standstone,[3] overlying Franciscan sedimentary rock. Interspersed among the Wilson Grove Formation is a Franciscan mélange of sandstone and shale. The Franciscan mélange is much more common to the north of Bodega Bay and to the south of Walker Creek, and, in that regard, geology helps distinguish the area from other coastal areas of

[2] California Department of Water Resources, "North Coast Hydrolic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated, June 14, 2014.
[3] Huffman, Michael E., *Geology for Planning on the Sonoma Coast Between the Russian River and Estero Americano*, California Division of Mines and Geology in cooperation with the Sonoma County Planning Department, 1973. Description based on Merced formation.

the Sonoma Coast AVA and from other locations within Marin County. The eastern sections of the viticultural area are home to greater Quaternary deposits of varying ages and origination including Pliocene marine deposits, landslide deposits, and alluvial deposits. The geology of Sonoma Mountain is mostly that of uplifted volcanic material, which is common to the Sonoma Mountains and the Mayacamas Mountains further to the east. Where sedimentation is found in the Sonoma Valley, a greater presence of sediment from volcanic parent material exists.

Hence, geology helps further distinguish the Petaluma Gap from surrounding viticultural areas. The California Department of Water Resources, for example, notes "the contact between the Franciscan and Wilson Grove Formation defines the Basin boundary on the north,"[4] referring to the groundwater basin that closely approximates much of the Petaluma Gap viticultural area (more on this topic is noted later in this report). The correlation, however, is far from a perfect match. As noted above, areas of Francican mélange are found within the Wilson Grove Formation in the Petaluma Gap. Similarly, the Wilson Grove Formation extends into the Russian River Valley AVA along the Sebastopol Hills. Meanwhile, Quaternary deposits define the Santa Rosa Plain also within the Russian River Valley, as well as the valley floor of the Sonama Valley. As a generalization, a safe assessment of the role geology plays in defining the Petaluma Gap AVA is that the Wilson Grove Formation is much more predominant in the Petaluma Gap, and has likely played a major role in the development of the topography.

Climate – Because of the topography noted above, marine influences invading the interior of Sonoma County are relatively unhindered by topographic barriers. Coastal air is drawn inland by diurnal heating patterns that cause convectional circulation patterns. In that regard, the climate of the Petaluma Gap is dependent on inland heating to act as a vacuum of cooler marine air. That pattern also explains the daily cycle for which the Petaluma Gap is known. An increase in coastal winds is common in the mid-afternoon, when inland locations have received enough insolation to create warmer ground temperatures, thus warming overlying air, creating convectional uplift, and thereby creating a pressure differential that draws in denser air off of the ocean. This daily attraction of coastal air into the interior of California is well known up and down the state's coast, but it plays an especially important role in Sonoma County viticulture.

The Petaluma Gap is located in a Mediterranean climate, with a winter rainy season, dry summers, and a long growing season. Because rainfall associated with cyclonic weather patterns are practically non-existent in the summer months, nor are thunderstorm activity or monsoonal weather patterns common, any stratus cloud layer is almost always associated with a marine inversion up to about 900-1000 feet in elevation. This marine inversion has a significant cooling effect along the coast, and often results in variations in high temperatures that can easily reach 30°F, sometimes 40°F, between coastal locations and inland locations. Some storm activity is found in April and May, but such activity is uncommon July through October. Because high pressure off the Pacific Coast often breaks down in late September and October, the marine inversion often gives way to

[4] California Department of Water Resources, "North Coast Hydrolic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated June 30, 2014.

offshore wind patterns during these months. This pattern reduces the presence of fog and often keeps temperatures warmer through September. The average high temperature in Petaluma, for example, is 81°F for September, only one degree cooler than the average high temperature for August (82°F).[5] The lack of storm activity in the area means that coastal fog is the dominant factor in the region's climatic variations.

Much has been studied about fog in Sonoma County, with work on fog patterns related to viticulture known to have been studied at various times by Robert Sisson (a former Sonoma County farm advisor for the University of California Cooperative Extension), Paul Vossen (Sonoma County farm advisor for the University of California Cooperative Extension), Carol Ann Lawson (in a M.A. thesis for the University of California, Davis), Patrick Shabram (a geography professor, viticultural geographer, and author of this report), Mike Bobbitt (a GIS specialist), Mark Greenspan (a winegrowing consultant), and Kimberly Nicholas [Cahill] (a professor and expert on the effects of climate change on agriculture) to name a few.[6] Yet, due to the variations in day to day patterns and region-wide movement of fog, average fog patterns are not completely understood. What has become increasingly clear is the importance that the Petaluma Gap plays in fog patterns throughout Sonoma County and even into Napa County and Solano County. Fog intrusions into the Russian River Valley AVA, the proposed Fountaingrove District AVA, the Sonoma Valley AVA, the Los Carneros AVA, and sub-AVA's contained within these AVAs are in part dependent on coastal air movement through the Petaluma Gap and then north on the Santa Rosa Plain and into the Sonoma Valley, or south towards San Pablo Bay and then east into the Sonoma Valley, Los Carneros, and the southern Napa Valley.

The Petaluma Gap is not the only source of marine fog invading Sonoma County. Fog intrudes through the Russian River Valley and the Golden Gate south of Marin County. The Russian River Valley AVA especially is influenced by the marine air invading through the Petaluma Gap. So too is fog moving into Los Carneros and the southern Sonoma Valley likely a result of advection inversions from both the Petaluma Gap and the Golden Gate via San Pablo Bay. These inversions subsequently moderate temperatures in many other viticultural areas in the region including the Fountaingrove District, northern Sonoma Valley, and up into the Napa Valley. While the exact role that advection of marine air through the Petaluma Gap plays in region-wide cooling is unclear, what is known is that the Petaluma Gap is the primary source for most intruding cool air into most of the Russian River Valley AVA, the proposed Fountaingrove AVA, the Sonoma Valley AVA, and western Los Carneros. Where fog may not intrude, cooler air lacking condensation continues to have a moderating effect on viticulture in areas of Sonoma and Marin County, including the Dry Creek Valley AVA, the Alexander Valley AVA, the Chalk Hill AVA, the Sonoma Mountain AVA, and the Moon Mountain District Sonoma County AVA, as well as in a number of viticulatural areas in counties to the east.

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[5] Western Regional Climate Center, Petaluma Fire Stn3, California (046826)

[6] Fog pattern studies have been varied and sometimes relayed in non-published communications, and/or have been prepared in reports considered proprietary, but relayed to the author of this report. Because of the varied nature of the works, they are not referenced here. Some of these works are referenced elsewhere in this document.

When so much of Sonoma County (and Marin County) is influenced by fog and marine inversions, what other than name distinguishes the Petaluma Gap from these surrounding AVAs? The answer may be in consistency. If advection of marine air helps define viticultural areas known to have cooler or moderately cooler climates, and if most of that marine air is moving inland through the Petaluma Gap, then the Petaluma Gap has to be experiencing these moderating effects first and on a more regular basis. As marine air intrusions fluctuate in extent and intensity throughout the region, the Petaluma Gap, as the corridor by which most fog moves inland, is not as prone to fluctuations in the extent of advection fog.

The consistency of this air movement through the Petaluma Gap is observed in graphics provided by Doug Cover, a former environmental consultant and vice president of the Petaluma Gap Winegrowers Alliance studying meteorological data on behalf of the Alliance. Mr. Cover's data (as of the writing of this report) show higher frequencies of wind above 8 miles per hour (13 kph) within the Petaluma Gap than areas on the Santa Rosa Plain, the Sonoma Valley, or Marin County south of the Petaluma Gap. A measurement of 8 miles per hour is significant because it is thought that sustained wind speeds at this level are sufficient to have an influence on photosynthesis rates.[7]

The presence of wind alone is not likely to distinguish the Petaluma Gap, as areas outside this wind gap have been known to contain higher wind speeds and average wind speeds induced by the same pressure gradients that are influenced by convection uplift inland. Airflow moving out of the wind gap would experience diffusion along the broad interior plains and fluvial valleys, but in cases like the Santa Rosa Plain, flatter topography reduces friction on air movement. Nevertheless, Mr. Cover's data show consistency in wind speeds between the hours of 12:00 PM and 6:00 PM (PST) during the growing season, ranging from 30.3% recorded wind speeds above 8 mph at Sun Chase Vineyard (located on the western slope of Sonoma Mountain facing the Petaluma wind gap)[8] to 89.5% of recorded wind speeds above this threshold at Valley Ford.[9] Other frequency of wind speeds at Bloomfield,[10] the Mecham Landfill,[11] Middle Two Rock,[12] Azaya Vineyard,[13] the Petaluma Airport,[14] and the Sonoma Baylands[15] weather stations show

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[7] Greenspan, Mark, "Row Direction—Which End is Up?," *Wine Business Monthly*, July 2008.

[8] Presumed to be a private weather station. Per the Fogline Vineyard website (foglinevineyards.com\vineyards), Sun Chase Vineyard is located between 900 to 1200 feet in elevation, but the exact location is unknown for this report.

[9] A weather station maintained by the Bay Area Air Quality Management District (BAAQMD) in Marin County near the Sonoma County line, 38.3084°N, 122.8974°W, 50 ft (15.2 m).

[10] The details of this weather station are unknown for this report. The approximate location is reported as 38.3180°N, 122.8530°W.

[11] The managing authority of this weather station is not known for this report. The positioning of the weather station was confirmed visually by the author of this report. The approximate location of the Mecham Landfill is 38.3°N, 122.7°W.

[12] The details of this weather station are unknown for this report. The approximate location is reported as 38.2480°N, 122.7250°W.

[13] A private weather station located at approximately 38.1536°N, 122.7115°W, 398 ft (121.3 m). A visual confirmation of the location of this station was conducted by the author of this report.

frequency of wind speeds above 8 mph during this time of day at 42.5%, 81.0%, 42.3%, 79.5%, and 82.3%, respectively. I would consider Sun Chase Vineyards at the edge of the Petaluma Gap, and the lower consistency of wind speed reported may or may not support differences in geographic characteristics used to support this analysis. Nevertheless, all of these numbers are higher than calculations done for weather stations to the north, east, and south of the Petaluma Gap. Calculations for a weather station in Occidental show 0.0% of wind speed readings during these afternoon hours higher than 8 mph, while stations at Bellevue Ranch (Santa Rosa Plain), in the Sonoma Valley, and at Novato show percentages of 9.3, 1.3, and 1.5, respectively.

A peer review of Mr. Cover's work is outside the scope of this report. Given Mr. Cover's experience and my own communication with Mr. Cover, I would consider him qualified to make these assessments of meteorological data. There are a few inherent issues with the data provided, all of which have been acknowledge by Mr. Cover. Perhaps the most important is data range and availability. Most of the weather stations include data from 2012 and 2013, with a few of the stations assessed including data from 2009-2013. The data from Azaya Vineyards are only from 2012, as are Novato data. Meanwhile, the Petaluma Airport data analyzed are from 1993 to 1997, well before the earliest assessed year for any other weather station reported. The patterns of afternoon winds are clear over a good distribution of weather station locations. Further, given the consistency in summer climatic patterns in the area, wind patterns probably do not vary within a significant range from year to year, hence the conclusions reached by Mr. Cover's analysis are likely sufficient to demonstrate the role afternoon wind plays in the Petaluma Gap. Any petition to the TTB should include a clear demonstration of why the analysis is limited to the hours of 12:00 PM to 6:00 PM and its viticultural significance. More on that point is noted below.

A common pattern for the movement of fog inland along the California Coast is a nocturnal marine inversion that burns off during the morning hours. Then as inland areas become warmer throughout the day, differences in local air pressure reach their peak in the middle afternoon. Hence fog commonly invades many coastal areas in the mid to late afternoon, with the marine inversion in place through the night. This common pattern has been well documented, and there is no reason to believe different patterns exist in the Petaluma Gap. Further, conversations with local growers confirm the typical day-to-day pattern of air movement. Quantifying this air movement is problematic, however. Mike Bobbitt has used aerial imagery to track fog movement through the Petaluma Gap and into central Sonoma County, but research covers limited time frames and is incomplete. By focusing on wind patterns during the 12:00 PM to6:00 PM hours, Mr. Cover's analysis offers quantification of marine air movement, assuming other microclimatic factors are not affecting the results. As noted later in this report, other subtle clues confirm what is well-known by local growers, that movement of air from the coast is the primary climatic influence affecting the area during the growing season.

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[14] Maintained by BAAQMD, 38.2597°N, 122.6113°W, 80 ft (24.4 m), this station stopped operation in 1998.

[15] Maintained by BAAQMD, 38.1316°N, 122.4747°N, 3 ft (1 m).

For the most part, Mr. Cover's results match my experience working with Sonoma County viticultural areas. My own experience working on projects similar to this one in the Occidental area leads me to accept, intuitively, Mr. Cover's contrasts of frequency of wind speeds in Petaluma Gap compared to the Occidental station. Similarly, I've worked with data in the Sonoma Valley, and given the position of the Sonoma Valley station (north of the city of Sonoma), the results are also intuitive to my understanding. In both cases, my experience has been with average wind speeds and/or maximum wind speeds and not wind speed frequencies. As I have never researched climatic patterns in the Novato area, I cannot speak from experience.

Where Mr. Cover's analysis doesn't completely match my expectation based on my experience studying the Sonoma County climate is in the contrast between the Petaluma Gap and the Santa Rosa Plain. In past studies, I have compared average wind speeds on the Santa Rosa Plain to weather stations within or close to the Petaluma Gap. I should note that my sample of wind speeds within the Petaluma Gap has been limited and most of these comparative analyses were with stations just to the north of the proposed Petaluma Gap AVA. I have found average wind speeds at various stations on the Santa Rosa Plain, including Windsor and Santa Rosa, to be similar, if not greater, than average wind speeds at stations near or within the proposed Petaluma Gap AVA. As such, a closer look at wind speeds between the Santa Rosa Plain and the Petaluma Gap is warranted. Table 1 demonstrates average growing wind speeds at three Sonoma stations within the California Irrigation Management Information Systems (CIMIS) network and two Bay Area Air Quality Management District (BAAQMD) stations within the Petaluma Gap. Since data from the Bennett Valley were readily available, and since these data should demonstrate speeds slower than those on the Santa Rosa Plain, these data were included. Note these are average growing season wind speeds and not frequency of wind speeds above 8 mph during the hours of 12:00 PM to 6:00 PM.

Table 1 – Average wind speeds within the Petaluma Gap Viticultural Area and at other Sonoma County CIMIS stations (Petaluma Gap stations shaded in gray).

Station	Average Wind Speed (mph)					
	2014	2013	2012	2011	2010	2009
Sonoma Baylands (BAAQMD)	N/A	8.1	7.6	7.3	7.7	8.0
Valley Ford (BAAQMD)	N/A	8.5	7.6	7.4	8.0	8.0
Bennett Valley CIMIS #158	2.6	2.6	2.5	2.4	N/A	2.6
Windsor CIMIS #103	3.6	3.9	3.3	3.2	3.4	3.3
Santa Rosa CIMIS #83	4.3	N/A	4.1	4.0	3.9	3.9

The average wind speeds noted in Table 1 suggest higher wind speeds through the Sonoma Gap (at these weather stations) than in the Russian River Valley AVA and the Bennett Valley AVA. My past work comparing and contrasting the Santa Rosa Plain wind speeds was a comparison of data from the Freestone-Occidental area (lower wind speeds than the Santa Rosa Plain) and mostly weather stations just north of the Petaluma Gap (comparable to lower wind speeds than the Santa Rosa Plain). Any wind data need to be taken with an understanding that these stations are representative and don't constitute universal conditions throughout an area. Nevertheless, average wind speeds appear to be higher within the Petaluma Gap than on the Santa Rosa Plain. Further, since my own past research found lower speeds outside just outside the proposed Petaluma Gap AVA, this experience further support the Petaluma Gap as holding unique characteristics when compared to areas outside the proposed AVA.

A fourth Sonoma County CIMIS station, Petaluma East (#144) was also evaluated. This station, however, may not be the best representation of average conditions in the Petaluma Gap. I've used this station in past analyses, but it often shows results that run counter to many local professionals' expectations, and more recently it has had holes in the data. The growing network of private and public weather stations confirms the apparent anomalies at the Petaluma East station and have caused me to question the reliability of this weather station. Faults within the equipment, the placement of the equipment, or subtle characteristics related to this location may account for results that appear unrepresentative. For this report, Petaluma East CIMIS #144 has not been used.

Multi-year frequency calculations are beyond the scope of this study, but I did check the percent of wind speeds above 8 mph during the hours of 12:00 PM to 6:00 PM at the Santa Rosa CIMIS #83 station and the Windsor CIMIS #103 station for 2014. The Santa Rosa station showed 44.3% of hourly afternoon temperature readings above 8 mph. Windsor CIMIS #103, however, showed only 12.5% of wind speeds above this threshold. While the Santa Rosa station showed afternoon wind speeds within the range found within the Petaluma Gap, albeit on the lower end of the range, Windsor did not. Hence, conditions exist at locations on the Santa Rosa Plain that are consistent with the Petaluma Gap, but these conditions do not appear to be as widespread as they are within the Petaluma Gap viticultural area.

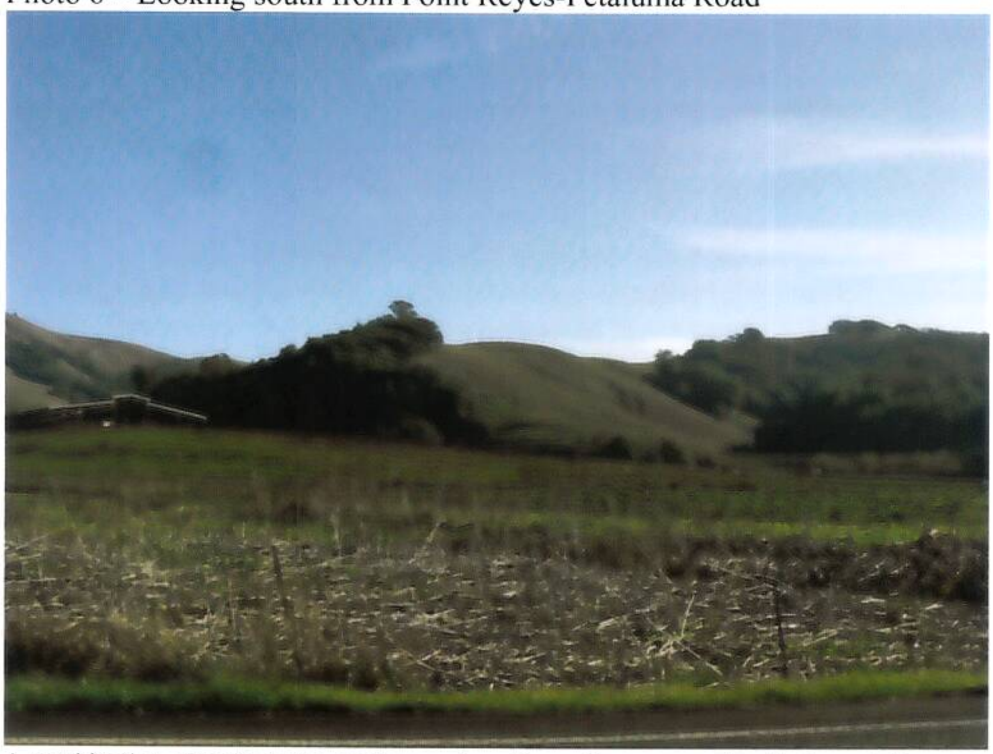
The important role that wind plays in the Petaluma Gap is seen in local natural vegetation. While vegetation in California is commonly more abundant on north-facing slopes due to decreased insolation and thus decreased evaporation rates, in the Petaluma Gap the leeward side (usually east side) of hills often sees greater vegetation. This characteristic is not universal throughout the gap, as vegetation is sometimes greater on north-facing slopes or within protected valleys, but obviously exposure to wind plays a role in the natural vegetation of the area (Photos 5 and 6). Wind influences viticulture by affecting photosynethesis rates, both by affecting evapotranspiration rates and leaf movement [16] and the development of grape skins. Further, the nature of these wind patterns and related fog, which increases in the mid- to late-afternoon, means the moderating effect of coastal air is greatest during the time of day when temperatures would normally be at their highest. These climatic influences ultimately affect the conditions under which grapes are grown, hence affecting the characteristics of grapes produced in the area.

[16] Greenspan, Mark, "Row Direction—Which End is Up?," *Wine Business Monthly*, July 2008.

Photo 5 – Looking west from Clary Vineyards

Vegetation is more pronounced on this hill on the leeward side (east side) than on the windward side. A second hill to the north shows the same pattern.

Photo 6 – Looking south from Point Reyes-Petaluma Road



A combination of north facing and leeward positions allows more abundant vegetation on parts of these slopes, but sections of the windward, north-facing slopes remain free of trees.

A review of climate for viticulture would not be complete without taking a look at temperature. In this case, Petaluma Gap is consistent with many other areas of coastal Sonoma and Marin counties, environments suited to grapes that are faster to mature, and hence better suited for cooler climates. In past projects, I have calculated or worked with growing degree totals at various locations between 2096°F and 3326°F in the Sonoma Valley to the east (2006-2010),[17] 1801°F to 2580°F growing degree days just to the north of the Petaluma Gap and onto the Santa Rosa Plain (2002-2010),[18] and 1933°F to 2081°F in the Freestone-Occidental area (2001-2006).[19] These were all calculated using daily growing degree day accumulations for temperatures above 50°F throughout the growing season.

Doug Cover has collected temperature data from a number of weather stations in the Petaluma Gap and surrounding areas. The following table outlines the finding of Mr. Cover's analysis:

Table 2 – Growing degree day accumulations (Petaluma Gap stations in gray)

Weather Station	Growing Degree Days °F				
	2013	2012	2011	2010	2009
Valley Ford	1012	1087	1223	1162	1364
Bloomfield	1660	1417	N/A	N/A	N/A
Mecham Landfill	1962	1698	1572	N/A	N/A
Middle Two Rock	1786	1508	N/A	N/A	N/A
Azaya Vineyard	N/A	1816	N/A	N/A	N/A
Sun Chase Vineyards	2484	3110	2089	N/A	N/A
Sonoma Baylands	2515	2251	2022	1916	2243
Occidental	2183	1985	1804	1685	N/A
Novato	N/A	N/A	N/A	N/A	2059
Sonoma Valley	3098	2861	N/A	N/A	N/A
Bellevue Ranch	2648	2280	2310	2257	N/A

Source: Doug Cover

The Cover calculations are made using hourly accumulations of heat summations, while my calculations have used daily accumulations. The differences in calculation result in small variations in degree day accumulations. Nevertheless, the numbers presented by Mr. Cover are consistent with expectations based on past studies of Sonoma County viticulture. Based on my understanding of the area, I would expect heat summations to be lower closer to the Pacific Coast (e.g., Valley Ford) and higher but still low further inland or closer to San Pablo Bay (e.g., Mecham Landfill and Sonoma Baylands, respectively). I would also expect most years to show growing degree day totals to be well below 3000°F at every station within the Petaluma Gap. Further, I would expect the Santa Rosa Plain (Bellevue Ranch) to be slightly warmer than the Petaluma Gap; Sonoma Valley to be consistent with or slightly warmer than the Santa Rosa Plain; and Occidental to be within

[17] Shabram, Patrick, "Geographic Analysis of the Moon Mountain Area of the Sonoma Valley," 2011.
[18] Multiple studies
[19] Greenspan, Mark, "Freestone Regional Climate Evaluation and Comparison," 2007.

the range found within the Petaluma Gap. In nearly every example, this scenario plays out.

The one anomaly appears to be Sun Chase Vineyards in 2012 with a degree day total of 3110°F. What is noteworthy is that 2012 was a cooler year than 2013 for every station reporting data for those two years other than Sun Chase Vineyard. As noted above, this station is at the edge of the Petaluma Gap and may show characteristics not consistent with the Petaluma gap every year. A possible explanation may be the higher elevation found at this vineyard. If the inversion layer was on average lower in the 2012 growing season, then Sun Chase Vineyards may have had uncharacteristic temperature patterns. Another explanation may be the climatic data itself, either because of a faulty temperature logger or some element of the stations' surroundings that influenced meteorological conditions. Whatever the reason, Sun Chase Vineyards displayed weather conditions in both 2013 and 2011 consistent with the cool climates characteristic of the marine-influenced locations within Sonoma and Marin counties.

Finally, most of the Sonoma County section of the Petaluma Gap falls within an area previously identified by Robert Sisson, former UC Extension form advisor, as "Marine." This work was portrayed graphically by Paul Vossen,[20] demonstrating the Petaluma Gap area clearly within the "Marine" climate type. The intent of Sission's work was to direct growers to plant grapes favorable to cool-climate environments in the "Coastal Cool" climate type, grapes favorable to warmer climates in the "Coastal Warm" climate types, and to avoid planting grapes within the "Marine" climate type. These classifications were based loosely on a method for establishing degree day totals based on hours of temperatures between 70°F and 90°F. Following is the description provided with Paul Vossens' map, which also demonstrates that the Petaluma Gap was a large part of this climate zone:

> MARINE: The marine zone is under direct ocean influence, lying west of the first mountain ridges of the coast below 1,000 ft. and extending inland through river canyons and the Petaluma gap to Sonoma Mountain. Degree Days per year average 2,185, but range from less than 1,800 to 2,800 depending on the year. This zone also has less than 800 hours between 70 and 90°F during the growing season (April 1 to Oct. 31). It is the coolest of the three local climatic zones.

Sisson's understanding was that heat accumulations in the marine climate type would be insufficient to allow for proper maturation in grapes.[21] While Sisson's classification was well conceived for its time (approximately in the 1950s to 1980s), the model is in need of an update as successful viticulture exists in many of the areas originally classified as "Marine." What is perhaps more important in defining the Petaluma Gap is the role fog played in Mr. Sission's original classification. The "Marine" climate was based more on Sisson's observed areas of "heaviest" fog intrusion.[22] Hence, the role of fog on

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[20] Vossen, Paul, *Sonoma County Climatic Zones*, University of California Cooperative Extension Service, Sonoma County, 1986.

[21] Shabram, Patrick L., "Redefining Appellation Boundaries in the Russian River Valley, California," M.A. thesis, San Jose State University, 1998.

[22] Lawson, Carol Ann, "Guidelines for Assessing the Viticultural Potential of Sonoma County: An Analysis of the Physical Environment," M.A. Thesis, University of California, Davis, 1976.

temperature in the Petaluma Gap as it relates to viticulture has long been understood, even if speculations as to viticultural viability were inaccurate.[23]

Soils – A review of soils is complicated by the multiple counties involved. A complete Soil Conservation Services (National Soil Resources Conservation Service - NRCS) soil survey of Sonoma County was published in 1972, while a similar soil survey of Marin County was published in 1985. With the ongoing evolution of US Soil Taxonomy classifications, soils with very similar characteristics may have received different classifications between the two soil surveys. This scenario seems to be case with Steinbeck Loams (Sonoma County) and Tomales Loams and Tomales-Steinbeck Loams (Marin County). Steinbeck Loams are described by NRCS as "fine-loamy, mixed, superactive, mesic Ultic Haplustalfs" and are further noted as consisting of "deep, well drained soils that formed in material weathered from soft sand-stone. Steinbeck soils are on smooth rolling hills and have slopes of 2 to 50 percent. The mean annual precipitation is about 30 inches and the mean annual temperature is about 55 degrees F [*sic*]." This description is very similar to that of Tomales soils, defined as "fine, mixed, superactive, mesic Ultic Paleustalfs" consisting of "deep, moderately well drained soils that formed on strongly weathered, soft sandstone. Tomales soils are on smooth, rolling hills. Slopes are 2 to 50 percent. The mean annual precipitation is about 30 inches and the mean annual temperature is about 54 degrees F [*sic*]."[24] A few subtle differences are noted between these soil types, including typical pedon (northeast slopes for Tomales series soils compared to southwest slopes for Steinbeck series soils), but the soil series are so similar that Steinbeck series soils have been classified with Steinbeck-Tomales soils in this report.

Other soil series may be combined between the counties to simplify the number of soil types present, but collectively Steinbeck/Tomales (including Tomales) series soils are the most common to the Petaluma Gap covering 24.0% of the proposed AVA. Even with further simplification, the diversity of soil types present indicates that soil does not play a predominant role in defining the proposed AVA. A few generalizations are possible. The Steinbeck/Tomales soils are dominant in the western part of the Petaluma Gap, while Goldridge, Hugo, and Sebastopol series soils tend to dominate areas around Occidental and Sebastopol to the north of the Petaluma Gap. Cotati and Haire series soils are the most common in the eastern part of the Petaluma Gap, while soil series common to the Clear Lake-Reyes and Huichica-Wright-Zamora associations are found in to the Santa Rosa Plain and Goulding, Toomes, Red Hill, and Huichica soils are more common to the Sonoma Valley. The correlation of soil series to other characteristics defining the different viticultural areas, however, is far from precise.

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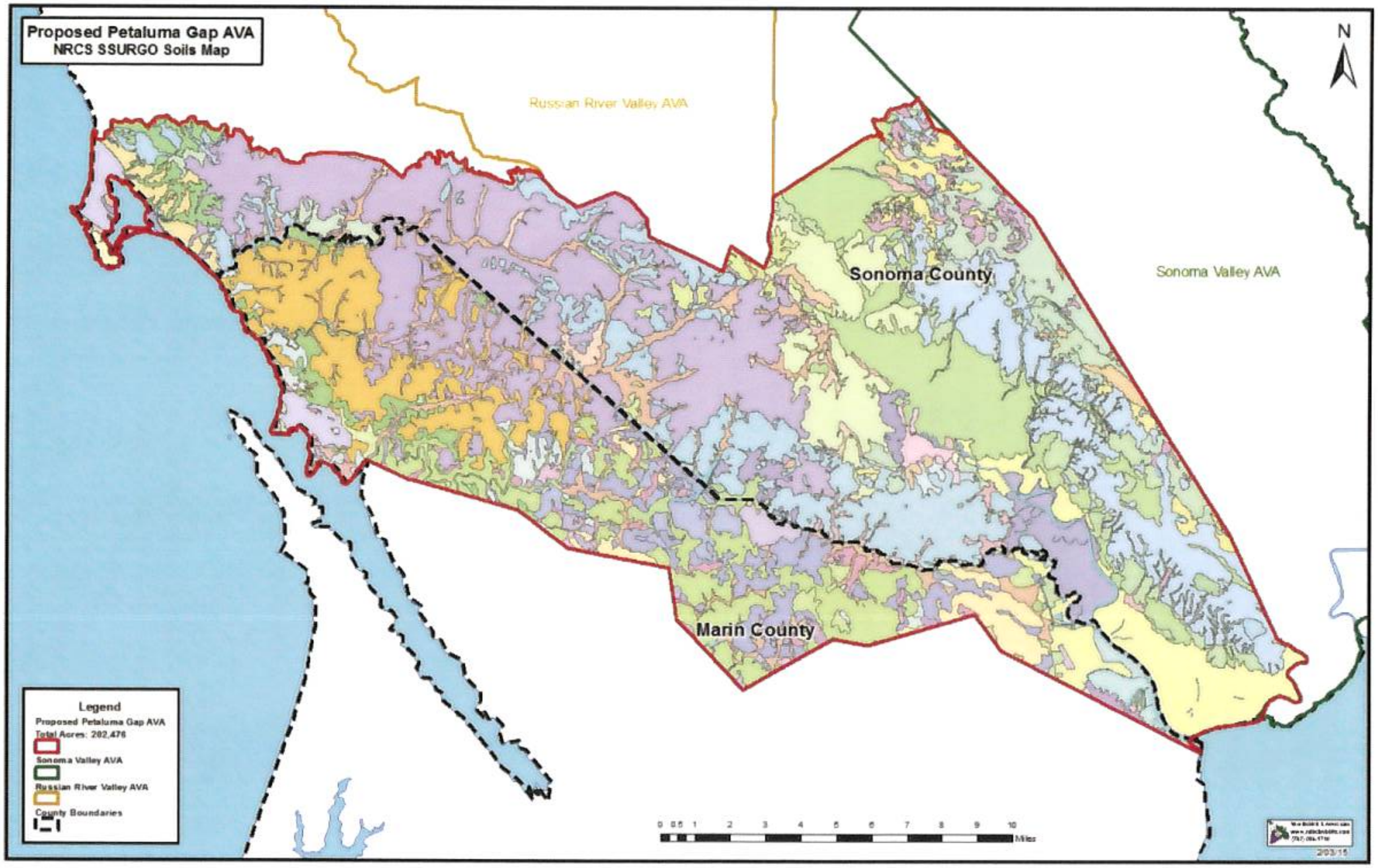
[23] It should be pointed out that viticultural practices have improved since Sisson's original work, which may account for some of the growth of viticulture in areas previously thought to be too cold for wine grape production. In a 1997 telephone conversation, Mr. Sisson noted that viticulture had been unsuccessful in some of the areas he came to label as "[m]arine," and, with limited experimentation, he had advised against wine grape plantings throughout that climate type. Also note that research into climate change and local climatic patterns has been insufficient to assume that recent plantings may be the result of a warming climate.

[24] All soil descriptions are official soil descriptions as identified on the NRCS website.

Map 3 – NRCS soils series of Petaluma Gap[25] (legend is on the following page)



[25] Steinbeck and Tomales-Steinbeck loams have been consolidated into Tomales-Steinbeck.

Map 3 Legend and Table 3 – Common soil series of the Petaluma Gap

Legend

NRCS SSURGO Soils (Reclassified)

Marin & Sonoma County Soils Surveys

- ALLUVIAL LAND
- ARBUCKLE GRAVELLY LOAM
- BALLARD GRAVELLY
- BARNABE VERY GRAVELLY LOAM
- BAYWOOD LOAMY SAND
- BEACHES
- BLUCHER
- BONNYDOON GRAVELLY LOAM
- BONNYDOON VARIANT-GILROY-GILROY VARIANT LOAMS
- BRESSA VARIANT-MCMULLIN VARIANT COMPLEX
- CLEAR LAKE
- COASTAL BEACHES
- CORTINA
- COTATI FINE SANDY LOAM
- DIABLO CLAY
- DUNE LAND
- FELTON VARIANT-SOULAJULE COMPLEX
- FLUVENTS
- GILROY-GILROY VARIANT-BONNYDOON VARIANT LOAMS
- GOLDRIDGE FINE SANDY LOAM
- GOULDING
- GOULDING-TOOMES COMPLEX
- GULLIED LAND
- Gravel Pits
- HAIRE
- HELY SILT LOAM
- HENNEKE STONY CLAY LOAM
- HYDRAQUENTS
- KIDD STONY LOAM
- KINMAN LOAM
- KINMAN-KNEELAND LOAMS
- KNEELAND
- KNEELAND ROCKY COMPLEX
- KNEELAND ROCKY SANDY LOAM
- LANIGER LOAM
- LOS GATOS LOAM
- LOS OSOS CLAY LOAM
- LOS OSOS-BONNYDOON COMPLEX
- MONTARA
- NOVATO CLAY
- OLOMPALI LOAM
- PAJARO
- PITS
- PLEASANTON
- RAYNOR CLAY
- REYES CLAY
- REYES SILTY CLAY
- RIVERWASH
- ROCK LAND
- ROCK OUTCROP-XERORTHENTS COMPLEX
- RODEO CLAY LOAM
- ROHNERVILLE LOAM
- SAURIN-BONNYDOON COMPLEX
- SEBASTOPOL SANDY LOAM
- SHERIDAN COARSE SANDY LOAM
- SIRDRAK SAND
- SOBEGA LOAM
- SOBRANTE LOAM
- STONYFORD GRAVELLY LOAM
- TERRACE ESCARPMENTS
- TIDAL MARSH
- TOCALOMA-MCMULLIN COMPLEX
- TOCALOMA-SAURIN ASSOCIATION
- TOMALES LOAM
- TOMALES-STEINBECK
- TOOMES ROCKY LOAM
- URBAN LAND-XERORTHENTS COMPLEX
- WATER
- XERORTHENTS
- XERORTHENTS-URBAN LAND COMPLEX
- YOLO CLAY LOAM
- YORKVILLE CLAY LOAM
- YORKVILLE-ROCK OUTCROP COMPLEX
- ZAMORA SILTY CLAY LOAM

Soil Type	Acres	Percent
TOMALES-STEINBECK	35,789.5	17.7%
LOS OSOS CLAY LOAM	17,480.9	8.6%
CLEAR LAKE	16,759.4	8.3%
DIABLO CLAY	15,158.4	7.5%
TOMALES LOAM	12,704.6	6.3%
TOCALOMA-SAURIN ASSOCIATION	10,637.1	5.3%
BLUCHER	9,239.1	4.6%
COTATI FINE SANDY LOAM	8,091.4	4.0%
REYES SILTY CLAY	7,400.1	3.7%
LOS OSOS-BONNYDOON COMPLEX	6,861.8	3.4%
GOULDING	6,761.3	3.3%
HAIRE	3,814.6	1.9%
TIDAL MARSH	3,549.6	1.8%
TOCALOMA-MCMULLIN COMPLEX	3,094.7	1.5%
GOULDING-TOOMES COMPLEX	2,614.6	1.3%
SOBEGA LOAM	2,428.2	1.2%
DUNE LAND	2,288.9	1.1%
YORKVILLE CLAY LOAM	2,201.2	1.1%
FELTON VARIANT-SOULAJULE COMPLEX	2,129.4	1.1%
WATER	2,101.2	1.0%
KNEELAND ROCKY COMPLEX	1,997.7	1.0%
RAYNOR CLAY	1,882.9	0.9%
REYES CLAY	1,742.8	0.9%
SAURIN-BONNYDOON COMPLEX	1,678.4	0.8%
ROHNERVILLE LOAM	1,621.6	0.8%
PAJARO	1,510.7	0.7%
LANIGER LOAM	1,506.8	0.7%
GULLIED LAND	1,489.2	0.7%
NOVATO CLAY	1,438.7	0.7%
ARBUCKLE GRAVELLY LOAM	1,430.1	0.7%
SEBASTOPOL SANDY LOAM	1,405.1	0.7%
KNEELAND	1,098.4	0.5%
ZAMORA SILTY CLAY LOAM	975.9	0.5%
BALLARD GRAVELLY	946.8	0.5%
GILROY-GILROY VARIANT-BONNYDOON VA	885.0	0.4%
YOLO CLAY LOAM	675.0	0.3%
BONNYDOON GRAVELLY LOAM	666.1	0.3%
TOOMES ROCKY LOAM	638.0	0.3%
ALLUVIAL LAND	597.1	0.3%
YORKVILLE-ROCK OUTCROP COMPLEX	586.7	0.3%
KIDD STONY LOAM	565.0	0.3%
RODEO CLAY LOAM	555.5	0.3%
XERORTHENTS	386.7	0.2%
FLUVENTS	382.7	0.2%
PLEASANTON	338.2	0.2%
BARNABE VERY GRAVELLY LOAM	329.0	0.2%
BRESSA VARIANT-MCMULLIN VARIANT CO	326.8	0.2%
MONTARA	301.2	0.1%
SOBRANTE LOAM	270.1	0.1%
OLOMPALI LOAM	265.8	0.1%
SHERIDAN COARSE SANDY LOAM	240.2	0.1%
SPRECKELS LOAM	239.0	0.1%
BONNYDOON VARIANT-GILROY-GILROY VA	216.8	0.1%
TERRACE ESCARPMENTS	195.8	0.1%
KNEELAND ROCKY SANDY LOAM	189.8	0.1%
ROCK OUTCROP-XERORTHENTS COMPLEX	166.4	0.1%
SIRDRAK SAND	142.7	0.1%
LOS GATOS LOAM	137.2	0.1%
HYDRAQUENTS	134.6	0.1%
COASTAL BEACHES	101.8	0.1%
BAYWOOD LOAMY SAND	101.5	0.1%
BEACHES	99.9	0.0%
KINMAN LOAM	96.9	0.0%
CORTINA	90.1	0.0%
HENNEKE STONY CLAY LOAM	85.8	0.0%
RIVERWASH	85.6	0.0%
URBAN LAND-XERORTHENTS COMPLEX	80.1	0.0%

2/3/15

Watershed/Groundwater

Drainage from throughout the Petaluma Gap either flows into the Pacific Ocean via various streams or to San Pablo Bay primarily via the Petaluma River. Most of the Pacific drainage is through Americano Creek, Stemple Creek, Walker Creek, or Salmon Creek to the north. Watershed is significant in that it has been used to distinguish the Russian River Valley AVA. A small portion of the proposed Petaluma Gap AVA falls within the Russian River watershed in the northeastern-most extent of the area, but other geographic characteristics distinguish this area from the Russian River Valley AVA. Further, the Sonoma Valley AVA to the east drains to either Sonoma Creek or Santa Rosa Creek, which eventually drains into the Russian River Valley. Other than the related topography affecting drainage, watershed has little bearing on viticulture in the area. As is the case with the Russian River Valley noted earlier, drainage can play a role in name recognition. In the case of the Petaluma Gap, however, airflow more than drainage offers the greatest attribute associated with the name.

Groundwater drainage, a result of underlying geology, weathering, and soil permeability, more closely identifies with the Petaluma Gap viticulture. Most of the Petaluma Gap falls within the Wilson Grove Formation Highlands Groundwater Basin as defined by the California Department of Water Resources. This basin is identified as follows:

> Wilson Grove Formation Highlands Groundwater Basin is an irregularly shaped basin in northern Marin and southern Sonoma Counties. The basin is bounded by Chileno Valley on the south, Bodega Bay on the west, and the Tolay Fault on the east. The contact between the Franciscan and Wilson Grove Formation defines the Basin boundary on the north…The cities of Sebastopol and Forestville are located in the north of the basin and the city of Petaluma is located in the south.[26]

The Petaluma Gap, as defined by this report, extends to just north of Bodega Bay along the coast to just south of the Chileno Valley or on the southern extent of the Chileno Valley. Depending on which part of the Tolay Fault is being referred to, the proposed AVA extends just to the east of or at the southern section of the Tolay fault line. Further, the city of Petaluma is located within the AVA. This groundwater basin, however, extends north of the Petaluma Gap up to the cities of Sebastopol and Forestville, which place it well into the Russian River Valley AVA. Nevertheless, geology, especially as it relates to the Wilson Grove Formation and this groundwater basin, helps distinguish the Petaluma Gap from areas to the northwest, south, and east of the proposed AVA.

Name Recognition

Perhaps no viticultural area not officially recognized as an AVA by the TTB is as well-known as the Petaluma Gap. The name is already used regularly in media reports, including those specific to wine and viticulture, by local growers, and by government agencies. The Bay Area Air Quality Management District (BAAQMD), for example,

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[26] California Department of Water Resources, "North Coast Hydrologic Region: Wilson Grove Formation Highlands Water Basin," *California's Groundwater Bulletin* 118, 1980, last updated June 30, 2014.

states on its website: "Wind Patterns in the Petaluma and Cotati Valleys are strongly influenced by the Petaluma Gap."[27] The usage of the name Petaluma Gap is not a recent trend, as demonstrated in the above quote from the University of California Cooperative Extension. A search of the Geographic Names Information System from the USGS Board on Geographic Names provides no results for the query "Petaluma Gap," which means the name is not in this database. Common usage of the name would not be difficult to demonstrate. Further, no other geographic area is believed to be known by this name.

Extending/Overlapping/Nested AVAs

With a revision to its regulations in 2007, the TTB has taken steps to prevent overlapping AVAs in future new AVAs and AVA expansions. The justification for this adjustment to the AVA system is the basic dilemma of how two AVAs can be unique viticultural areas, and yet share common territory. The possibility exists for overlapping AVAs, but a strong justification must be made. AVAs may be seeded entirely within another AVA, but justification must be made as to why the sub-AVA is unique from other areas within the larger AVA, but still consistent with the larger AVA. Similarly, an AVA may be created that entirely encompasses another AVA, but again, adequate justification must be made for how the encompassed AVA is consistent with the larger area.

In the case of the Petaluma Gap, two AVAs are of concern. The first is the Sonoma Coast AVA. The second is the North Coast AVA. In both cases, the Petaluma Gap will include areas both within and outside the existing AVAs. Following is a discussion of each.

Sonoma Coast AVA – The Sonoma Coast AVA, created in 1987 (TD ATF-253), was based primarily on Robert Sisson's coastal cool classification and the area coming under the greatest coastal influences. While the Treasury decision establishing the Sonoma Coast AVA specifically points to the coastal cool climate as opposed to the coastal warm climate type, the AVA as drawn includes areas defined by Sisson as coastal cool and areas defined as marine climates. Further, the Treasury decision specifically correlates fog intrusion with the Sonoma Coast AVA.[28] This Treasury decision, however, specifically ties the Sonoma Coast AVA to Sonoma County. In no place in TD ATF-253 is Marin County noted. Nor is the name "Sonoma Coast" easily identifiable to Marin County.

The Petaluma Gap, as proposed in this report, includes areas of both Sonoma County and Marin County. Given the reliance on fog intrusion and coastal-influenced climate types, the Sonoma County section of the Petaluma Gap should remain within the Sonoma Coast AVA. The Marin County section, however, lacks appropriate name recognition. Hence, strong justification exists to keep the Sonoma County section of the Petaluma Gap within the Sonoma Coast AVA, while the Marin County section of the Petaluma Gap should remain outside the Sonoma Coast AVA.

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[27] http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Bay-Area-Climatology/Subregions/Cotati-and-Petaluma-Valleys.aspx

[28] *Federal Register*, Vol. 52, No. 112, June 11, 1987, page 22303.

North Coast AVA – The North Coast AVA was established in 1983 (TD ATF-145), based primarily on climate. The Treasury decision specifically addresses maritime influences including coastal fog and, in the case of Lake County, "coastal air." The original petition to establish the North Coast AVA included the counties of Mendocino, Sonoma, and Napa, limiting North Coast to these counties based primarily on name recognition. During the public comment process, arguments were made for the inclusion of portions of Lake County, Solano County, and Marin County. The Marin County addition, however, was limited to the northeastern part of the county. As such, the eastern portion of the Marin section of the Petaluma Gap as proposed in this report is inside the North Coast AVA, while the western (coastal) part is out.

The argument for including part of Marin County in the North Coast AVA was based on climatic conditions in line with those found within the rest of the North Coast AVA, along with similar topography. Evidence was provided by Herbert M. Rowland demonstrating these similarities. The TD ATF-145 notes that "most of Marin County has a similar climate to the North Coast."[29] Data were provided, however, that showed significantly cooler climates at Point Reyes than in the rest of Marin County, which provided justification for limiting the Marin addition to the eastern side of the county. It should be noted that Point Reyes is well south of the Petaluma Gap and is a peninsula surrounded by the cold waters of the Pacific Ocean. Further, the Sonoma coastal section of the Petaluma Gap is already in the North Coast AVA.

As noted above, no data were provided with TD ATF-145. I tried to find a weather station at Point Reyes to compare temperatures there to the Valley Ford station, which is located just inside Marin County, and hence within the Petaluma Gap but not within the North Coast AVA. Unfortunately, the only data I could locate for Point Reyes was a buoy station, which included weather data, just off the coast.[30] Degree day totals for this station were calculated at 891°F, below the 1102°F calculated for the Valley Ford station for the same year. It is important to note, however, that this buoy station is surrounded by water, and should not be used to draw conclusions to differentiate land-based climatic conditions. As any supporting materials provided with the North Coast AVA public comment are unavailable, I am unable to understand the source of the information provided to the ATF or how applicable it is to North Coast viticulture.

What is more readily available are data from stations in Marshall[31] and Point Reyes Station[32] on Tomales Bay in Marin County about outside the North Coast AVA, but not nearly as exposed to the Pacific Ocean as Point Reyes. Because hourly data were unavailable for these stations, degree day totals based on daily accumulations were calculated for 2013 and compared to recalculated data (using the same methodology) from the Petaluma Gap and within the North Coast AVA. Degree day totals for Marshall

[29] *Federal Register*, Vol. 48, No. 184, September 21, 1983, page 42975.
[30] Data provided to the National Oceanic and Atmospheric Administration by Scripps Institute of Oceanography, station 46214, Point Reyes, CA, 37.496°N, 123.469°W.
[31] Source: Weather Underground (wunderground.com), KCAMARSH3 (Tomales Bay Oyster Co. Cove), 38.116°N, 122.854°W.
[32] Source: Weather Underground (wunderground.com), KCAPOINT2 (Point Reyes Mesa bluff), 38.080°N, 122.817°W.

were 1784°F, almost identical to 2013 totals at Bloomfield with 1787°F. The Bloomfield station is located within the Petaluma Gap and within the North Coast AVA. The Bloomfield station also is at a site with successful viticulture currently present. Meanwhile, degree day totals at the Point Reyes Station weather station were calculated at 2042°F, which is higher than the Bloomfield location. Hence, the original boundaries for the North Coast, excluding part of Marin County based on the idea that this area is cooler than the North Coast AVA, do not accurately reflect any significant climatic shift.

Therefore, an expansion to the North Coast AVA is warranted to include all of the Petaluma Gap. Evidence provided in Doug Cover's data and in this report should be sufficient to demonstrate the climatic similarities between all of the Petaluma Gap and the North Coast AVA. Further, the details of this report, which demonstrate the congruity of the Petaluma Gap, should be sufficient to demonstrate the similarities of the proposed expansion area to the North Coast AVA.

Conclusion

The Petaluma Gap AVA, well understood as a viticultural area within the California wine industry, shares similarities within the Sonoma Coast AVA, with cooler climates favoring cool-climate grape production. Similarly, the Petaluma Gap viticultural area is moderated by marine air. Much of this marine air infiltrating Sonoma County and defining the Sonoma Coast AVA does so via the Petaluma Gap.

The Petaluma Gap is distinguished from other areas of the Sonoma Coast, as well as other areas of Marin County, by its topography and the persistency of afternoon winds. These winds play a role in photosynthesis and grape development, and hence viticulture of the area. Further, the Petaluma Gap has geological characteristics and groundwater characteristics that help distinguish the region from surrounding areas. As such, establishment of a TTB-recognized, unique viticultural area, pursuant to the requirements of Title 27 CRF Part 9, is warranted, and the Petaluma Gap Winegrowers Alliance is encouraged to petition the TTB for establishment of this AVA.

While the Petaluma Gap demonstrates unique viticultural characteristics that encompass areas both within Sonoma County and Marin County, the Sonoma Coast AVA is specific to just Sonoma County. Hence, a Petaluma Gap AVA that extends beyond the current boundaries of the Sonoma Coast is warranted. Further, an expansion of the North Coast AVA to match the Petaluma Gap viticultural area is warranted, and any petition to establish the Petaluma Gap AVA should include an expansion to the North Coast AVA.

Proposed Boundaries

Petaluma Gap AVA - The following descriptions identify the recommended boundaries based on this study, including consideration of the work of Doug Cover, feedback from members of the Petaluma Gap viticutural industry, and the author's own observations while in the field. A simple general rule is that the boundary encompasses the rolling hills below 1000 feet in southwestern Sonoma County and northern Marin County. Along the fringes of the viticultural area, elevations above 1000 feet are present, but the peaks of these constraining topographic features have been used for simplification. So too have the coastline of the Pacific Ocean and San Pablo Bay been utilized for simplification despite being unlikely locations for viticulture (in the case of the Pacific Ocean, temperatures would be too cool and in the case of San Pablo Bay, marshlands would be unlikely to support viticulture).

The one area in which the boundary offers some challenge is along Sonoma Mountain. The Sonoma Valley AVA, adjacent in other areas to this proposed Petaluma Gap AVA, and the Sonoma Coast AVA, within which the Sonoma County section of the proposed AVA is located, utilize the Sonoma Mountain summit to mark their respective boundaries. Sonoma Mountain serves as a barrier for intruding marine air through the Petaluma Gap, causing air to divert either to the north toward the Santa Rosa Plain or south towards San Pablo Bay. The summit offers the easiest demarcation, but includes areas not just above 1000 feet in elevation, but areas above 2000 feet in elevation. Ideally a boundary that utilizes some elevation line, perhaps 1200 feet, might offer a more correct boundary to the geographic characteristics of the Petaluma Gap. In absence of good data to establish how maritime air, moving in a relatively unhindered path to Sonoma Mountain, moves along these higher elevations, I have created recommended boundaries that follow the common boundary between these other AVAs. Sonoma Mountain has commonly been referenced in defining the Petaluma Gap, and several written and graphical representations of the Petaluma Gap utilize this common boundary.

This boundary follows points found on the following quadrangles of USGS 7.5' Series topographic maps:

Cotati, California
Glen Ellen, California
Petaluma River, California
Sears Point, California
Petaluma Point, California
Novato, California
Petaluma, California
Point Reyes NE, California
Tomales, California
Bodega Head, California
Valley Ford, California
Two Rocks, California

1) The beginning point is on the Cotati map at the intersection of Grange Road (known as Crane Canyon Road to the west) and the boundary of sections 9 and 16, T6N, R7W. From the beginning point, proceed in a straight line 1.0 mile southeast to intersection of the 900 foot elevation line and the boundary of sections 15 and 16, T6N, R7W, approximately 500 feet north of the southwest corner of section 15, then
2) Proceed in a straight line east-southeast 0.5 mile onto the Glen Ellen map to the terminus of an unnamed unimproved road just above 1080 feet in elevation just north of the boundary of sections 15 and 22, T6N, R7W, then
3) Proceed in a straight line southeast 0.6 mile to the intersection of Crane Creek and the 1200 foot elevation line, Section 22, T6N, R7W, then
4) Proceed southeast 2.9 miles to Sonoma Mountain to the horizontal control station 2,271 feet, T6N, R6W, then
5) Proceed in a straight line southeast 10.5 miles onto the Petaluma River map then Sears Point map to the summit of Wildcat Mountain, then
6) Follow a straight line south-southeast 3.3 miles to the intersection of Highway 121 and Highway 37, then
7) Follow Highway 37 east-northeast less than 0.1 mile to its intersection with Tolay Creek, then
8) Follow Tolay Creek in a general southerly direction 3.9 miles onto the Petaluma Point map to San Pablo Bay, then
9) Follow the San Pablo Bay shoreline in a general westerly direction 2.7 miles to Petaluma Point, then
10) Proceed in a straight line northwest 6.3 miles onto the Novato map, then onto the Petaluma River Map to the summit of Burdell Mountain, then
11) Proceed in a straight line northwest 1.3 miles to unnamed summit of 1193 feet, then
12) Proceed in a straight line east-southwest 2.2 miles onto the Petaluma map to an unnamed summit of 1209 feet, then
13) Proceed in a straight line west-southwest 0.8 mile to an unnamed summit of 1296 feet, then
14) Proceed in a straight line west 1.0 mile to the summit of Red Hill, section 31, T4N, R7W, then
15) Proceed in a straight line southwest 2.9 miles to the summit of Hicks Mountain, then
16) Proceed in a straight line west-northwest 2.7 miles onto the Point Reyes NE map to an unnamed summit of 1087 feet, then
17) Proceed in a straight line north-northeast 1.5 miles to an unnamed summit of 1379 feet, then

18) Proceed in a straight line west-northwest 2.9 miles to a spur of 935 feet located on an unnamed mountain exceeding 960 feet, then

19) Proceed in a straight line northwest 1.8 miles to an unnamed summit of 804 feet, then

20) Proceed in a straight line west-northwest 3.1 miles onto the Tomales map to an unnamed summit of 741 feet, then

21) Proceed in a straight line northwest 1.3 miles to BM10 on Highway 1, then

22) Follow the north shoreline of the Walker Creek estuary and then the Pacific coast in a general northwesterly direction 19.5 miles onto the Valley Ford and then Bodega Head maps to the mouth of Salmon Creek, then

23) Follow Salmon Creek 9.6 miles onto the Valley Ford map to the intersection of Salmon Creek and an intermittent stream, Estero Americano land grant, T6N, R10W, then

24) Proceed in a straight line east 1.0 mile to VABM 724 on an unnamed hilltop, Estero American land grant, T6N, R10W, then

25) Proceed in a straight line east-southeast 0.8 mile to BM 61 on an unnamed light duty road along Ebabbias Creek, Cañada de Pogolimi land grant, T6N, R10W, then

26) Proceed in a straight line southeast 0.6 mile to an unnamed summit of 488 feet, Cañada de Pogolimi land grant, T6N, R10W, then

27) Proceed in a straight line 0.1 mile southeast to the terminus of an unnamed unimproved road, Cañada de Pogolimi land grant, T6N, R10W, then

28) Proceed along this unimproved road northeast then south 0.9 mile to its intersection with the 400 foot elevation line, Cañada de Pogolimi land grant, T6N, R10W, then

29) Follow the 400 foot elevation line in an easterly direction 6.7 miles onto the Two Rocks map to its intersection with Burnside Road just north of BM 376, Cañada de Pogolimi land grant, T6N, R10W, then

30) Follow Burnside Road south less than 0.1 mile to the intersection with an unnamed medium duty road at BM 376, then

31) Proceed in a straight line southeast 0.6 mile an unnamed summit of 610 feet, T6N, R9W, then

32) Proceed in a straight line east-southeast 0.8 mile to an unnamed summit of 641 feet, T6N, R9W, then

33) Proceed northeast in a straight line that runs through the intersection of an intermittent stream and Canfield Road 1.2 miles to its intersection with the common boundary between Ranges 8 and 9, then

34) Proceed in a straight line southeast 0.5 mile to an unnamed summit of 524 feet, T6N, R8W, then

35) Proceed in a straight line southeast 0.8 mile to the intersection of an unnamed unimproved road (leading to four barn-like structures) and an unnamed medium duty road (known locally as Roblar Road), T6N, R8W, then

36) Proceed in a straight line south 0.5 mile to an unnamed summit of 678 feet, T6N, R8W, then

37) Proceed in a straight line east-southeast 0.8 mile to an unnamed summit of 599 feet, T5N, R8W, then

38) Proceed in a straight line east-southeast 0.7 mile to an unnamed summit of 604 feet, T5N, R8W, then

39) Proceed in a straight line east-southeast 0.9 mile onto the Cotati map to the intersection of a short unnamed light duty road leading past a group of barn like structures and Meacham Road, T5N, R8W, then

40) Follow Meacham Road north-northeast 0.8 mile to its intersection with Stony Point Road, T5N, R8W, then

41) Follow Stony Point Road southeast 1.1 mile to its intersection with the 200 foot elevation line, T5N, R8W, then

42) Proceed in a straight line north-northeast 0.5 mile to a point were an unnamed intermittent stream intersects U.S. Highway 101, T5N, R8W, then,

43) Follow U.S. Highway 101 in a northerly direction 1.5 miles to its intersection with the Gravenstein Highway (Highway 116), T6N, R8W, then

44) Proceed in a straight line 3.4 miles northeast to the intersection of Crane Creek and Petaluma Hill Road.

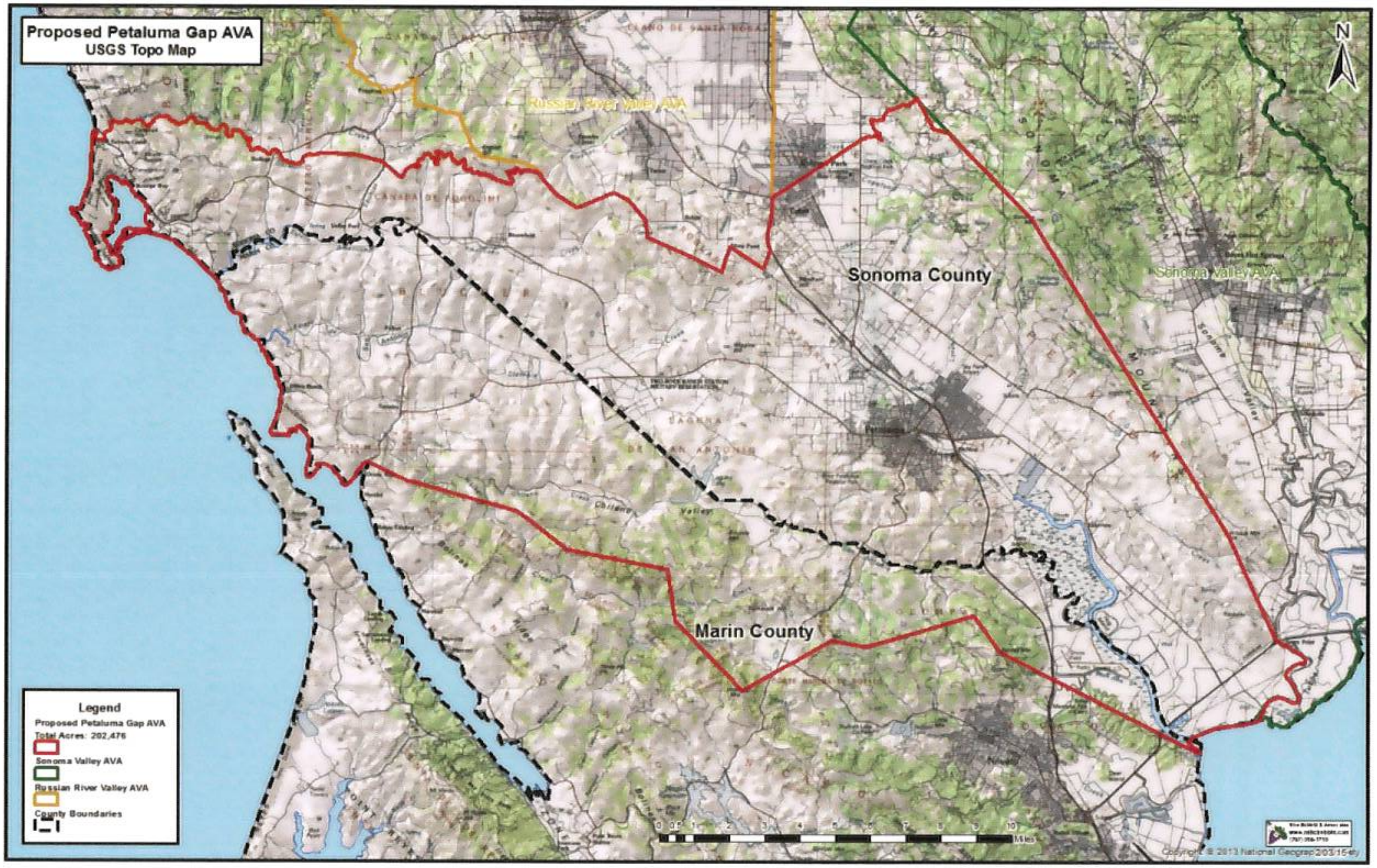
45) Follow Crane Creek in a general easterly direction 0.8 mile to the intersection of Crane Creek and the 200 foot elevation line, T6N, R7W, then

46) Follow the 200 foot elevation line in a general northerly direction 1.0 miles to its intersection with an intermittent stream just south of Crane Canyon Road, T6N, R7W, then

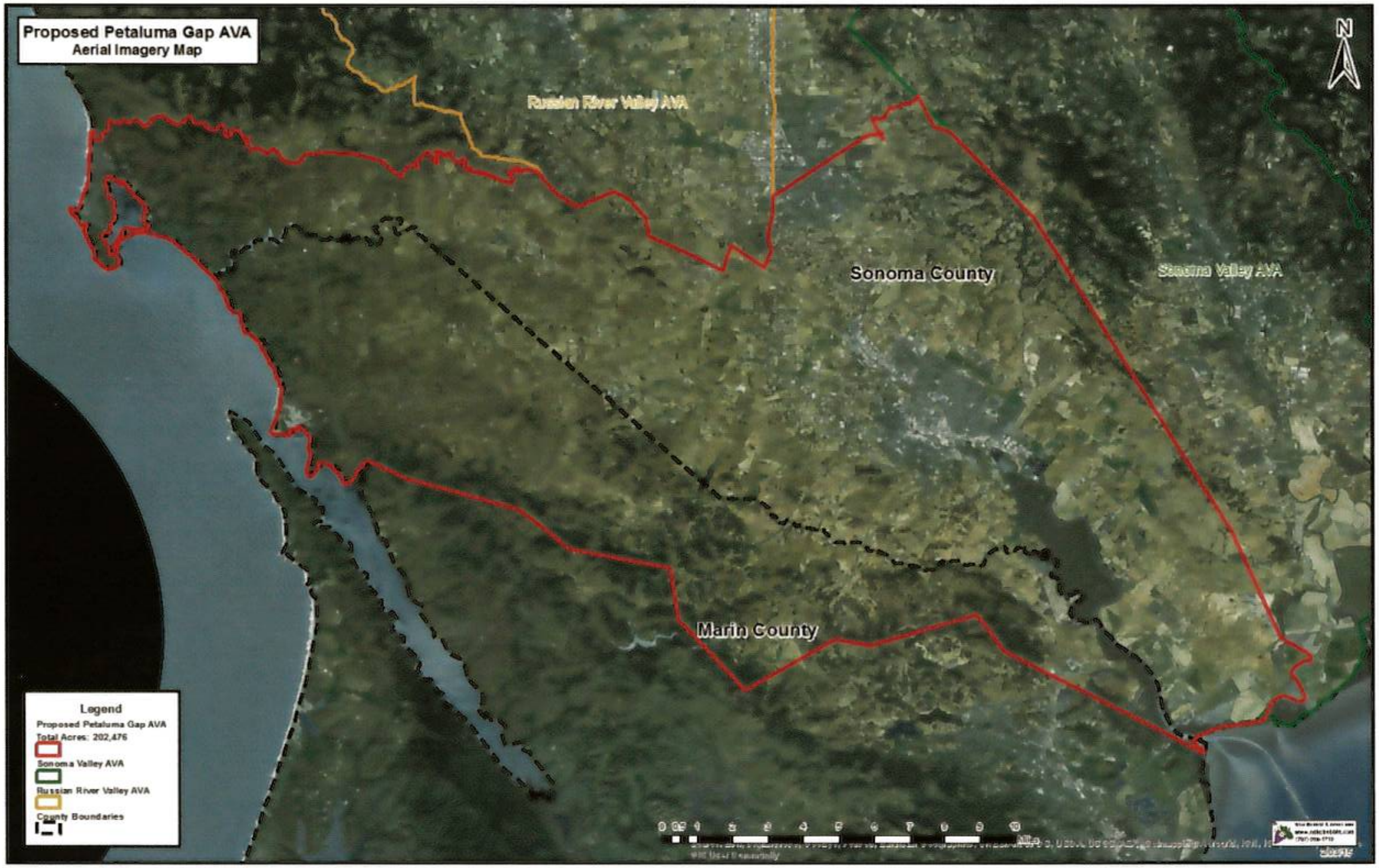
47) Follow this intermittent stream east then north along the northern branch of the stream 0.3 mile to its intersection with Crane Canyon Road, T6N, R7W, then

48) Follow Crane Canyon Road in a northeasterly direction 1.2 miles to the beginning point.

Map 4 – Proposed Petaluma Gap on USGS map



Map 5 – Proposed Petalum Gap AVA, aerial image



Expansion to the North Coast AVA – The proposed expansion to the North Coast AVA should use common borders with the Petaluma Gap AVA. This boundary expansion is based on the understanding that the characteristics of the Petaluma Gap AVA warrant its inclusion in the North Coast AVA. Any additional expansion (beyond the Petaluma Gap) is beyond the scope of this study. As a straight line runs from the northern part of the proposed Petaluma Gap AVA to a point well south of the Petaluma Gap (Barnabe Mountain), a point approximately along that line has been included in both the proposed boundaries for the Petaluma Gap and the revised North Coast AVA boundaries.

In addition to the current USGS 1:250,000 scale maps, the following map would be added as part of the proposed expansion:

"Tomales, CA," scale 1:24,000, edition of 1995 and photorevised in 1971.

"Point Reyes NE, CA," scale 1:24,000, edition of 1995 and photorevised in 1971.

From the beginning point on the Santa Rosa, California USGS 1:250,000, at the point where the Sonoma and Marin County boundary joins the Pacific Ocean, points (1) and (2) would be replaced with the following description:

1) Then follow the Pacific coast in a general southeasterly direction 9.4 miles onto the Tomales map to Preston Point;
2) Then east 1.0 mile along the north shoreline of the Walker Creek estuary to BM10 on Highway 1;
3) Then southeast in a straight line 1.3 miles to the an unnamed summit of 741 feet;
4) Then follow a straight line southeast 3.1 miles onto the Point Reyes NE to an unnamed summit of 804 feet;
5) Then southeast in a straight line 1.8 miles to an unnamed mountain spur of 935 feet;
6) Then southeast in a straight line 12.7 miles to the peak of Barnabe Mountain (elevation 1466 ft);

Following is the complete North Coast AVA boundary description including the proposed expansion.

The beginning point is found on the "Santa Rosa, California" U.S.G.S. map at the point where the Sonoma and Marin County boundary joins the Pacific Ocean.

1) Then follow the Pacific coast in a general southeasterly direction 9.4 miles onto the Tomales map to Preston Point;
2) Then northeast 1.0 mile along the north shoreline of the Walker Creek estuary to BM10 on Highway 1;
3) Then southeast in a straight line 1.3 miles to the an unnamed summit of 741 feet;

4) Then follow a straight line southeast 3.1 miles onto the Point Reyes NE to an unnamed summit of 804 feet;
5) Then southeast in a straight line 1.8 miles to an unnamed mountain spur of 935 feet;
6) Then southeast in a straight line for approximately 12.7 miles to the peak of Barnabe Mountain (elevation 1466 feet);
7) Then southeast in a straight line for approximately 10.0 miles to the peak of Mount Tamalpais (western peak, elevation 2604 feet);
8) Then northeast in a straight line for approximately 5.8 miles to the confluence of San Rafael Creek and San Rafael Bay in San Rafael;
9) Then north and northeast following San Rafael Bay and San Pablo Bay to Sonoma Creek;
10) Then north following Sonoma Creek to the boundary between Napa and Solano Counties;
11) Then east and north following the boundary between Napa and Solano Counties to the right-of-way of the Southern Pacific Railroad in Jameson Canyon;
12) Then east following the right-of-way of the Southern Pacific Railroad to the junction with the Southern Pacific in Suisun City;
13) Then north in a straight line for approximately 5.5 miles to the extreme southeastern corner of Napa County;
14) Then north following the boundary between Napa and Solano Counties to the Monticello Dam at the eastern end of Lake Berryessa;
15) Then following the south and west shore of Lake Berryessa to Putah Creek;
16) Then northwest following Putah Creek to the boundary between Napa and Lake Counties;
17) Then northwest in a straight line for approximately 11.4 miles to the peak of Brushy Sky High Mountain (elevation 3196 feet);
18) Then northwest in a straight line for approximately 5.0 miles to Bally Peak (elevation 2288 feet);
19) Then northwest in a straight line for approximately 6.6 miles to the peak of Round Mountain;
20) Then northwest in a straight line for approximately 5.5 miles to Evans Peak;
21) Then northwest in a straight line for approximately 5.0 miles to Pinnacle Rock Lookout;
22) Then northwest in a straight line for approximately 8.0 miles to Youngs Peak (elevation 3683 feet);
23) Then northwest in a straight line for approximately 11.2 miles to the peak of Pine Mountain (elevation 4057 feet);
24) Then northwest in a straight line for approximately 12.1 miles to the peak of Sanhedrin Mountain (elevation 6175 feet);
25) Then northwest in a straight line for approximately 9.4 miles to the peak of Brushy Mountain (elevation 4864 feet);
26) Then southwest in a straight line for approximately 17.6 miles to the confluence of Redwood Creek and the Noyo River;
27) Then west following the Noyo River to its mouth at the Pacific Ocean;
28) Then southeast following the Pacific Ocean shoreline to the point of beginning.

EXHIBIT B

Member Wineries and Growers of the Petaluma Gap Winegrowers Alliance

Member Wineries and Growers of the Petaluma Gap Winegrowers Alliance

Armagh Vineyard
Azari Vineyards & Winery
Bailiwick Wines
Bennett Valley Ranch, LLC
Brooks Note Winery
Clary Ranch Wines
Cline Cellars
Couloir Wines
Crichfield & Black
Devil's Gulch Ranch
Enriquez Estate Wines
Flocchini Estate, LLC
Fogline Vineyards
Grand Vent Vineyard
Griffin's Lair Vineyard
Guarachi Family Wines
Hendricks Vineyard at the Rockin-H Ranch
Jackson Family Wines
Janian Vineyards
Karah Estate Winery
Keller Estate Vineyards & Winery
Kendric Vineyards
Kosta Browne Wines
Leaf & Vine Wines
Lichau Hill Vineyards
MacPhail Family Wines
MacRostie Winery & Vineyards
Mala Closure Systems, Inc.
McEvoy Ranch
Morris Ranch
Pfendler Vineyards
Ramey Wine Cellars
Rice Spivak Vineyard
Saltonstall Estate
Sangiacomo Family Vineyards
Silverado Wine Growers
Sleepy Hollow Properties
Sojourn Cellars
Sonoma Valley Portworks
Stage Gulch Vineyards
Tolay Vista Vineyards
Toy Farm Vineyard
Trombetta Family Wines
WALT Wines
Waxwing Wine Cellars
Wildcat Mountain Vineyard
Wind Gap Wines

As of January 1, 2015

EXHIBIT C

USGS Topographic Maps
for the Petaluma Gap AVA
and the North Coast AVA Expansion

Note: Due to size limitations, the USGS maps are not included in the docket.